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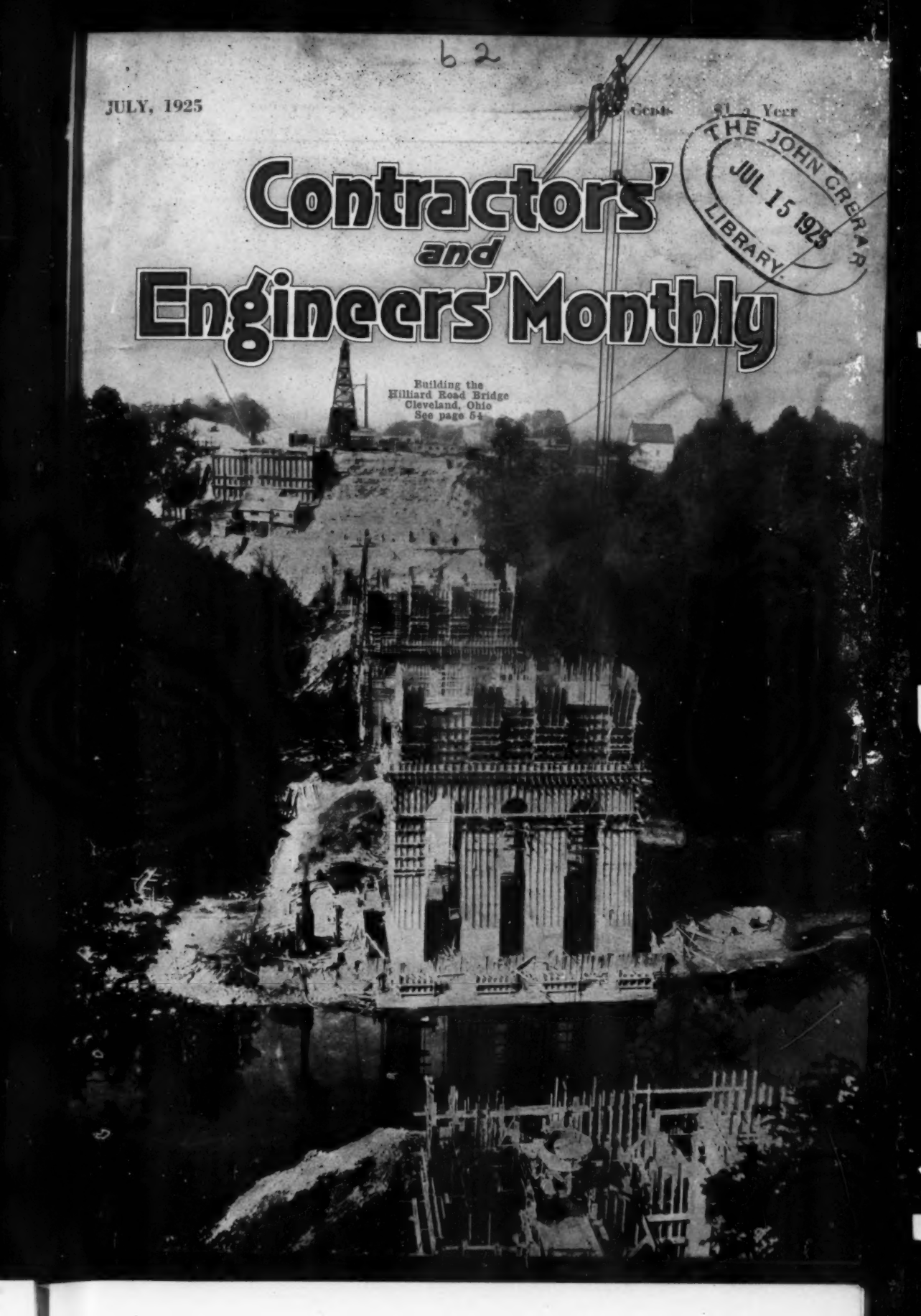

Building the
Hilliard Road Bridge
Cleveland, Ohio
See page 54

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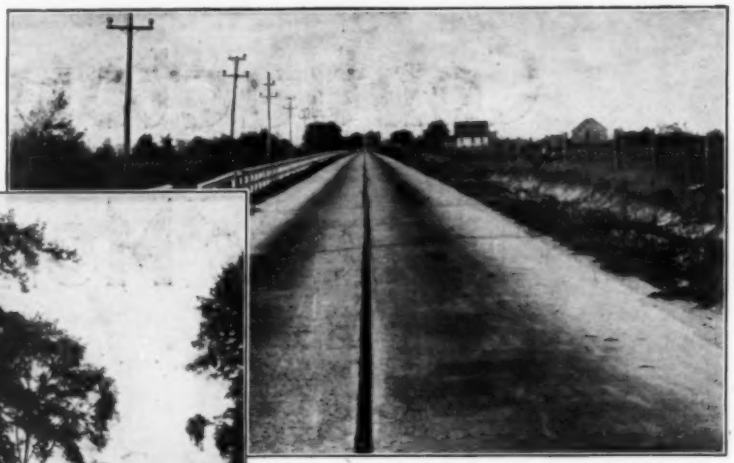

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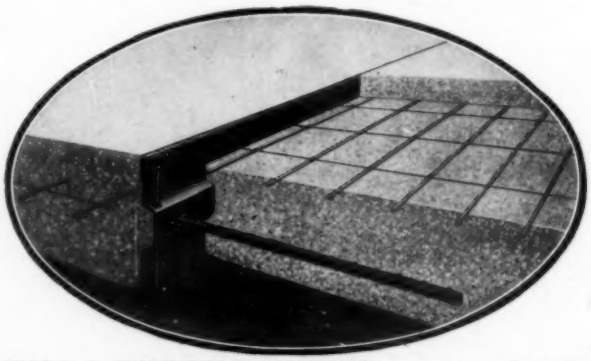

VOL. XI. No. 1 CONTRACTORS' & ENGINEERS' MONTHLY JULY, 1925
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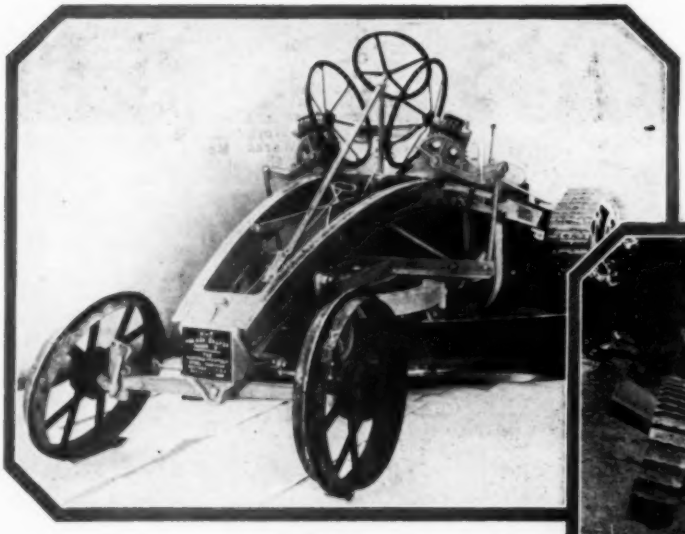

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The power of the Fordson can be used to even greater advantage by adding Hadfield-Penfield Rigid Rail Tracks, which turn the tractor into a crawler with ample traction for all conditions. Rough going made easy with these Crawler Tracks.

When there are so many places to use more road money why not save a lot of it with the Hadfield-Penfield Equipment?

It Has Made its Way by the Way it's Made.

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RIGID RAIL TRACKS

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ONE MAN GRADER

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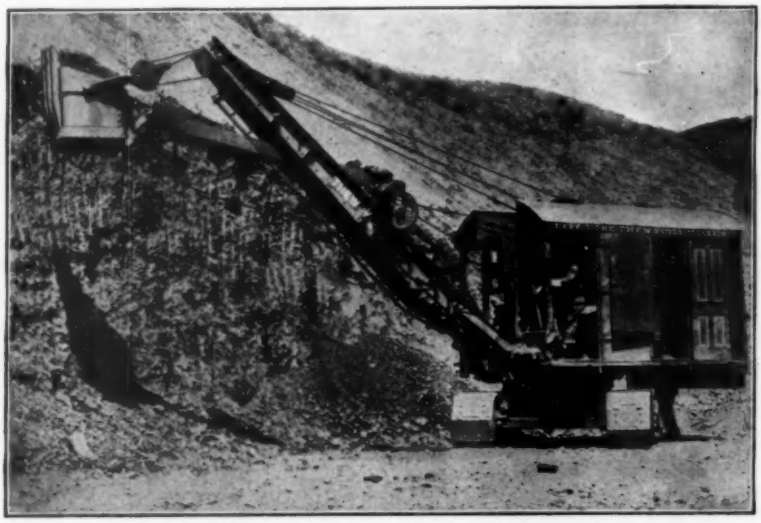

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Has More Clearance Underneath

Steers in Large or Small Radius Without Stopping.—Can be Towed by One Motor Truck—Will Walk Right Up a 30% Grade—Will Travel 1½ Miles per Hour—Can Dig Closer at Either End—Will Not Damage Pavements—Has Self-cleaning Treads and Drive Rollers—Has Tread Pins that Need No Lubrication—The Most Durable Truck Ever Built.

The CENTER DRIVE Does It.

A real estate company of Beverly Ridge, California, rented a certain make of power shovel for development work in hard lava formation.

It fell down hard and was ordered off the job.

Then another make tried it—and quit after breaking two booms and ruining three dipper sticks.

Meanwhile a Thew Gasoline Shovel, a ¾ yard Type O, belonging to Hake and Sweet of Los Angeles, was going strong on the job, two shifts a day without a grunt.

Then the real estate people looked for another Thew to rent.

This kind of thing is an old story with Thew Shovels. It's just another example of the thing that makes a Thew Owner a Thew Booster for life.

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Dig Faster—Last Longer

CEILINGS, METAL

Berger Mfg. Co., Canton, O.
Canton Art Metal Co., Canton, O.
Globe Iron Roofing & Cor. Co., Cincinnati, O.
Newport Rolling Mill Co., Newport, Ky.
Klauer Mfg. Co., Dubuque, Iowa.
Meeker & Co., Geo. L., Evansville, Ind.
Milwaukee Corrugating Co., Milwaukee, Wis.
Wheeling Corrugating Co., Wheeling, W. Va.

CEMENT

*Pennsylvania Cement Co., New York.
Ætna Portland Cement Co., Detroit, Mich.
Allentown Portland Cement Co., Allentown, Pa.
Alpha Portland Cement Co., Easton, Pa.
Ash Grove Lime and Portland Cement Co., Kansas City, Mo.
Atlas Portland Cement Co., New York.
Bath Portland Cement Co., Philadelphia, Pa.
Beaver Portland Cement Co., Portland, Ore.
Bessemer Limestone and Cement Co., Youngstown, O.
Canada Cement Co., Ltd., Montreal, Canada.
Clinchfield Portland Cement Corp., Kingsport, Tenn.
Colorado Portland Cement Co., Denver, Colo.
Cowell Portland Cement Co., San Francisco, Cal.
Crescent Portland Cement Co., Wampum, Pa.
Dewey Portland Cement Co., Kansas City, Mo.
Dexter Portland Cement Co., Nazareth, Pa.
Diamond Portland Cement Co., Cleveland, Ohio.
Dixie Portland Cement Co., Chattanooga, Tenn.
Edison Portland Cement Co., New York.
Giant Portland Cement Co., Philadelphia, Pa.
Gilmore Portland Cement Corp., Gilmore City, Iowa.
Glens Falls Portland Cement Co., Glens Falls, N. Y.
Golden State Portland Cement Co., Los Angeles, Cal.
Great West'n Port. Cem. Co., Kansas City, Mo.
Gulf States Portland Cement Co., Demopolis, Ala.
Hawkeye Portland Cement Co., Des Moines, Ia.
Helderberg Cement Co., Albany, N. Y.
Hercules Cement Corp., Philadelphia, Pa.
Hermitage Portland Cement Co., Nashville, Tenn.
Huron Portland Cement Co., Detroit, Mich.
Indiana Portland Cement Co., Indianapolis, Ind.
International Cement Corpn., New York.
International Portland Cement Co., Ltd., Spokane, Wash.
Kansas Portland Cement Co., Kansas City, Mo.
Knickerbocker Portland Cement Co., Inc., New York.
Kosmos Portland Cement Co., Louisville, Ky.
Lawrence Portl'd Cement Co., Northampton, Pa.
Lehigh Portland Cement Co., Allentown, Pa.
Louisville Cement Co., Louisville, Ky.
Manitowoc Portland Cement Co., Manitowoc, Wis.
Marquette Cement Mfg. Co., Chicago, Ill.
Missouri Portland Cement Co., St. Louis, Mo.
Monarch Cement Co., Humboldt, Kans.
Monolith Portland Cement Co., Los Angeles, Cal.
National Cement Co., Birmingham, Ala.
Nazareth Cement Co., Nazareth, Pa.
Nebraska Cement Co., Denver, Colo.
Newago Portland Cement Co., Newago, Mich.
New Egyptian Portland Cement Co., Fenton, Mich.
Northwestern States Portland Cement Co., Mason City, Ia.
Ogden Portland Cement Co., Ogden, Utah.
Oklahoma Portland Cement Co., Denver, Colo.
Olympic Portl'd Cement Co., Ltd., Seattle, Wash.
Oregon Portland Cement Co., Portland, Ore.
Pacific Portland Cement Co., San Francisco, Cal.
Peerless Portland Cement Co., Union City, Mich.
Peninsular Portland Cement Co., Cement City, Mich.
Penn-Allen Cement Co., Allentown, Pa.
Petoskey Portland Cement Co., Petoskey, Mich.
Phoenix Portland Cement Co., Nazareth, Pa.
Portland Cement Co. of Utah, Salt Lake City, Utah.
Pyramid Portland Cement Co., Des Moines, Ia.
Riverside Portl'd Cement Co., Los Angeles, Cal.
San Antonio Portland Cement Co., San Antonio, Tex.
Sandusky Cement Co., Cleveland, Ohio.
Santa Cruz Portland Cement Co., San Francisco, Cal.
Security Cement and Lime Co., Hagerstown, Md.
Signal Mountain Portland Cement Co., Chattanooga, Tenn.
Southern States Portland Cement Co., Rockport, Ga.
Southwest'n Portland Cement Co., El Paso, Tex.
Sun Portland Cement Co., Portland, Ore.
Superior Portland Cement Co., Seattle, Wash.
Texas Portland Cement Co., Dallas, Tex.
Three Forks Portland Cement Co., Denver, Colo.
Tidewater Portland Cement Co., Baltimore, Md.
Trinity Portland Cement Co., Dallas, Tex.
Union Portland Cement Co., Ogden, Utah.
U. S. Portland Cement Co., Denver, Colo.
Universal Portland Cement Co., Chicago, Ill.
Vulcanite Portland Cement Co., Philadelphia, Pa
Wabash Portland Cement Co., Detroit, Mich.
Wolverine Portl'd Cement Co., Coldwater, Mich
Wyandotte Portland Cement Co., Detroit, Mich

CEMENT GUNS

Cement Gun Co., Allentown, Pa.

CEMENT INSPECTION (See Inspecting Laboratories)

CEMENT TOOLS

Abrams Cement Tool Co., Detroit, Mich.

CENTRIFUGAL PUMPS

(See "Pumps, Centrifugal")

CHAINS

American Chain Co., Inc., Bridgeport, Conn.
Chain Belt Co., Milwaukee, Wis.
Columbus McKinnon Chain Co., Columbus, O.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago, Ill.
U. S. Chain & Forge Co., Pittsburgh, Pa.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

CHEMICALS FOR WATER PURIFICATION

Arnold, Hoffman & Co., Inc., New York.
Du Pont de Nemours & Co., E. I., Wilmington, Del.
Electro Bleaching Gas Co., New York.
General Chemical Co., New York.
Hooker Electrochemical Co., New York.
Mathieson Alkali Works, Inc., New York.
Penna. Salt Mfg. Co., Philadelphia, Pa.

CHIMNEYS, CONCRETE

Heine Chimney Co., Chicago, Ill.
Rust Engineering Co., Pittsburgh, Pa.
Weber Chimney Co., Chicago, Ill.

CHIMNEYS, RADIAL BRICK

American Chimney Corp., New York.
Alphons Custodis Chimney Const. Co., New York.
Heine Chimney Co., Chicago, Ill.
Heinicke, Inc., H. R., Indianapolis, Ind.
Kellogg & Co., M. W., New York.
Rust Engineering Co., Pittsburgh, Pa.

CHIMNEYS, STEEL (See Stacks, Steel)

CHLORINATORS

*Wallace & Tiernan Co., Inc., Newark, N. J.
Paradon Eng. Co., Long Island City, N. Y.

CHLORINE, LIQUID (See Liquid Chlorine)

CHUTES, CONCRETE

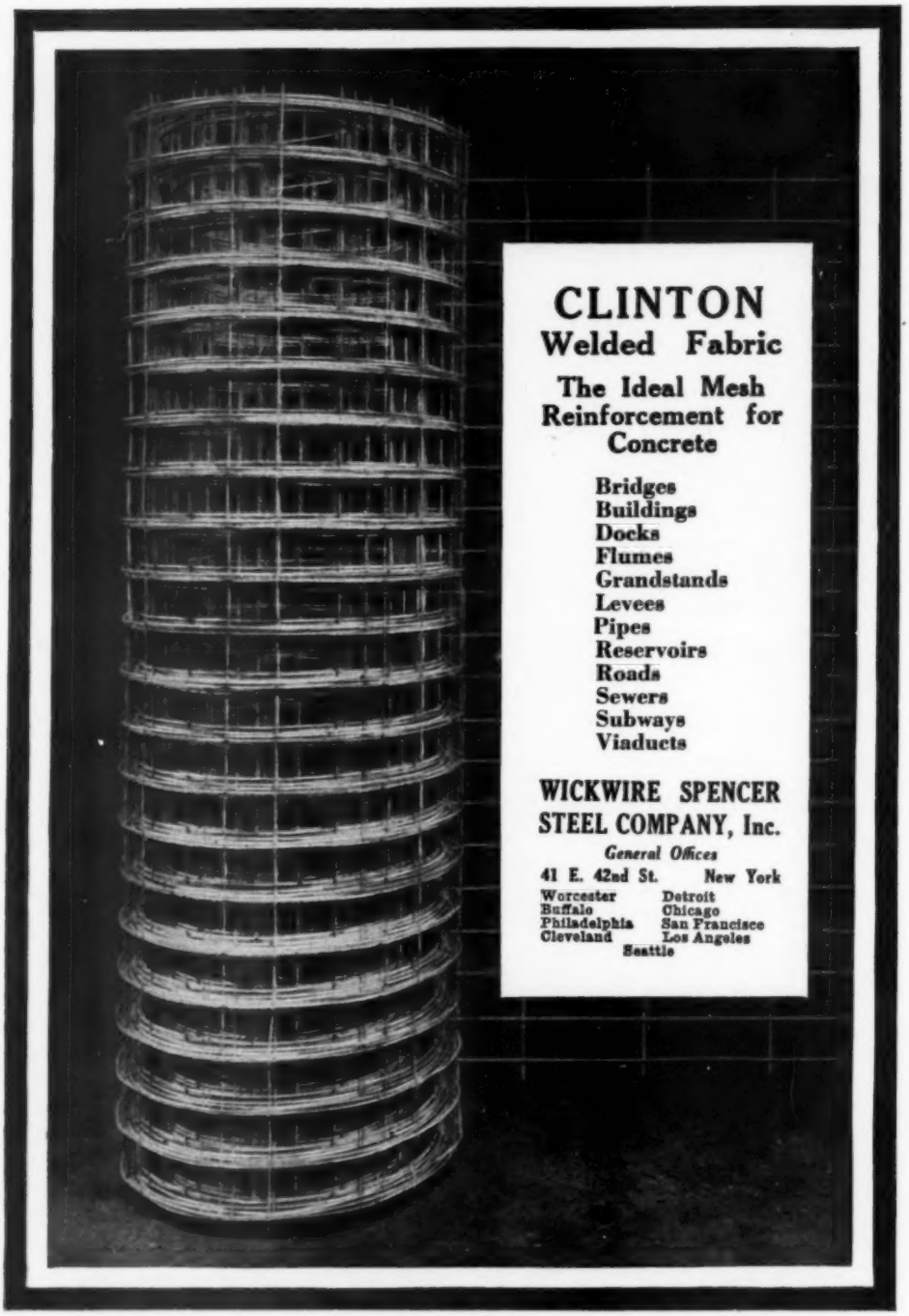
*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Engineering Co., Cleveland, O.
Ransome Concrete Mchy. Co., Dunellen, N. J.

CLIPS, WIRE ROPE

American Hoist & Derrick Co., St. Paul, Minn.
Fischer & Hayes Rope & Steel Co., Chicago, Ill.
Marion Malleable Iron Works, Marion, Ind.
Mockbee & Co., C. M., Cincinnati, O.
John A. Roebling Sons Co., Trenton, N. J.
Upson-Walton Co., Cleveland, O.

COAL AND ORE CONVEYING MACHINERY

*Barber-Greene Co., Aurora, Ill.
*Good Roads Mach'y Co., Kennett Square, Pa.


CLINTON
Welded Fabric
The Ideal Mesh Reinforcement for Concrete
Bridges
Buildings
Docks
Flumes
Grandstands
Levees
Pipes
Reservoirs
Roads
Sewers
Subways
Viaducts
WICKWIRE SPENCER STEEL COMPANY, Inc.
General Offices
41 E. 42nd St. New York
Worcester
Buffalo
Philadelphia
Cleveland
Detroit
Chicago
San Francisco
Los Angeles
Seattle

*Haiss Mfg. Co., Geo., New York.
*Liddgerwood Manufacturing Co., New York
*Mead-Morrison Mfg. Co., E. Boston, Mass.
Bartlett & Snow Co., C. O. Cleveland, Ohio.
Brown Hoisting Mchy. Co., Cleveland, O.
Chain Belt Co., Milwaukee, Wis.
Fairfield Engineering Co., Marion, Ohio
Gifford-Wood Co., Hudson, N. Y.
Green, L. P., Chicago, Ill.
Hunt Co., Inc., C. W., West New Brighton, N. Y.
Jeffrey Mfg. Co., Columbus, O.
Kon-Wald Co., Buffalo, N. Y.
Link-Belt Co., Chicago, Ill.
Portable Machinery Co., Passaic, N. J.
Robins Conv. Belt Co., New York
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

COCKS, CURB AND CORPORATION

*Union Water Meter Co., Worcester, Mass.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Glauber Brass Mfg. Co., Cleveland, Ohio.
Haydenville Co., Haydenville, Mass.
Mueller Company, Decatur, Ill.

COLLAPSIBLE HORSES

Taylor Collapsible Horse Co., Chicago, Ill.

COLUMN CLAMPS

*Insley Mfg. Co., Indianapolis, Ind.
*Sterling Wheelbarrow Co., Milwaukee, Wis.
*Universal Form Clamp Co., Chicago, Ill.
The O. D. G. Co., Owensboro, Ky.
Phillips, Co., Victor L., Kansas City, Mo.
Symons Clamp & Mfg. Co., Chicago, Ill.

COMPRESSORS, AIR (See Air Compressors)

CONCRETE FLOOR HARDENER

Anti-Hydro Waterproofing Co., Newark, N. J.
General Chemical Co., New York.
General Fireproofing Co., Youngstown, Ohio.
Granitex Corp., New York.
Horn Co., A. C., Long Island City, N. Y.
Master Builders Co., Cleveland, O.
Sonneborn Sons, Inc., L., N. Y. "Lapidolith"
Truscon Laboratories, Detroit, Mich.

CONCRETE HEATERS

*Aeroil Burner Co., Union Hill, N. J.

CONCRETE MIXERS

*American Cement Mchy. Co., Inc., Keokuk, Ia.
*Atlas Eng. Co., Milwaukee, Wis.
*Construction Mchy. Co., Waterloo, Iowa
*Industrial Plants Corp'n, Toledo, O.
*Jaeger Machine Co., Columbus, O.
*Koehring Co., Milwaukee, Wis.
*Kwik-Mix Concrete Mixer Co., Port Washington, Wis.
*Lakewood Engineering Co., Cleveland, O.
*Raber & Lang Mfg. Co., Kendallville, Ind.
*Smith Co., T. L., Milwaukee, Wis.
Badger Concrete Mixer Co., Milwaukee, Wis.
Chain Belt Co., Milwaukee, Wis.
Contractors' Equipment Co., Keokuk, Ia.
B. M. Cropp Co., Chicago, Ill.
Foote Concrete Mchy. Co., Chicago, Ill.
Gray Iron Fdry Co., Reading, Pa.
Judy Mfg. Co., Centerville, Ia.
Knickerbocker Co., Jackson, Mich.
Lansing Co., Lansing, Mich.
Leach Co., Oshkosh, Wis.
Marsh-Capron Co., Chicago, Ill.
Milwaukee Concrete Mixer Co., Milwaukee, Wis.
Ransome Concrete Mchy. Co., Dunellen, N. J.
Republic Iron Works, Tecumseh, Mich.
Schramm, Inc., West Chester, Pa.
Standard Scale & Supply Co., Pittsburgh, Pa.
Truckmixer Co., Milwaukee, Wis.
Worthington Pump & Mach'y Corp., New York.

CONCRETE PILING. (See Piling, Concrete)

CONCRETE PIPE (See Pipe, Reinforced Concrete)

CONCRETE REINFORCEMENT

*Truscon Steel Co., Youngstown O.
*Wickwire Spencer Steel Co., Inc., New York
American Steel & Wire Co., Chicago, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Concrete Steel Co., New York.
Consolidated Expanded Metal Co., Braddock, Pa.
Electric Welding Co., Pittsburgh, Pa.
General Fireproofing Co., Youngstown, O.
Inland Steel Co., Chicago, Ill.
Kalman Steel Co., Chicago, Ill.
Laclede Steel Co., St. Louis, Mo.
National Steel Fabric Co., Pittsburgh, Pa.
Ryerson & Son, J. T., Chicago, Ill.
Youngstown Pressed Steel Co., Warren, O.
Youngstown Sheet & Tube Co., Youngstown, O.

CONCRETE ROAD FINISHERS

*French & Co., A. W., Chicago, Ill.
*Heltzel Steel Form & Iron Co., Warren, O.
*Lakewood Engineering Co., Cleveland, O.
Dunn Road Mach. Co., Conneaut, Ohio.

CONCRETE SURFACING MACHINES

*Concrete Surfacing Machy. Corp., Cincinnati, O.

CONCRETE TOOLS

*Dallett Co., Thos., Philadelphia, Pa.

CONDENSERS

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Dean Bros. Co., Indianapolis, Ind.
Ingersoll-Rand Co., New York.
Westinghouse Elec. & Mfg. Co., E. Pittsb'gh, Pa.
Wheeler Condenser & Eng. Co., Carteret, N. J.
Worthington Pump & Mach'y Corp., New York

CONDUIT RODS

Bissell Co., F., Toledo, Ohio.
Turbine Sewer Machine Co., Milwaukee, Wis.
Waldo Bros. & Bond Co., Boston, Mass.

CONDUITS, UNDERGROUND

American Vitrified Products Co., Akron, Ohio.
Johns-Manville Inc., New York
National Fireproofing Co., New York.
Ric-wiL Co., Cleveland, O.

CONTRACTORS' SUPPLY DEALERS
(See pages 123-141)

CONVEYORS, BELT

*Austin-Western Rd. Mach'y Co., Chicago, Ill.
*Barber-Greene Co., Aurora, Ill.
*Good Roads Mach'y Co., Kennett Square, Pa.
*Haiss Mfg. Co., Geo., New York.
*Russell Grader Mfg. Co., Minneapolis, Minn.
Chain Belt Co., Milwaukee, Wis.
Gifford Wood Co., Hudson, N. Y.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago, Ill.
Olson & Co., Sam'l, Chicago, Ill.
Portable Machinery Co., Passaic, N. J.
Robins Conv. Belt Co., New York.
Standard Conveyor Co., No. St. Paul, Minn.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

CONVEYORS, BUCKET

*Atlas Engineering Co., Milwaukee, Wis.
*Good Roads Mach'y Co., Kennett Square, Pa.
*Haiss Mfg. Co., Geo., New York.
*Mead-Morrison Mfg. Co., E. Boston, Mass.
*Russell Grader Mfg. Co., Minneapolis, Minn.
Bartlett & Snow Co., C. O., Cleveland, O.
Caldwell & Son, H. W., Chicago, Ill.
Chain Belt Co., Milwaukee, Wis.
Fairfield Engineering Co., Marion, Ohio
Gifford Wood Co., Hudson, N. Y.
Godfrey Conveyor Co., Elkhart, Ind.
Guarantee Constn. Co., New York.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago, Ill.
Olson & Co., Sam'l, Chicago, Ill.
Republic Rubber Co., Youngstown, O.
Robins Conv. Belt Co., New York.
Stephens Adamson Mfg. Co., Aurora, Ill.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

CONVEYORS, GRAVITY

Dow Co., Louisville, Ky.
Lamson Co., Syracuse, N. Y.
Mathews Gravity Carrier Co., Elwood City, Pa.
Standard Conveyor Co., No. St. Paul, Minn.

COUPLINGS, HOSE

Cleveland Pneumatic Tool Co., Cleveland, O.
Ingersoll-Rand Co., New York.

Built in 1909, this typical Tarvia street is still in perfect condition after 16 years of service.

Tax-Payers Reelect Road Commissioner

Voters Repeat Performance of Last Election—Keep Commissioner Edwards in Office

By an overwhelming vote of confidence yesterday, J. E. Edwards was reelected to the office of Road Commissioner, a post which he has held continuously since 1909. The absence of all opposition testifies to the complete endorsement by the taxpayers of the Road Commissioner's program.

Old residents can recall when Commissioner Edwards, advocating a comprehensive policy of road construction, repair, and maintenance, first took office in 1909. Fifteen years ago. Prior to his encumbency the streets of the community were in sorry shape. Yet with considerably less than a liberal appropriation, Mr. Edwards was able to accomplish wonders.

Main Street was his first objective. So far gone was the surface of this main thoroughfare, it was decided to completely [illegible] the work was done in the summer

The road official's record is "out in the open"—

Tarvia Service *Chapter VII*

AS all public officials know, no official record is more completely out "in the open" than that of the road commissioner. If old roads are not well kept up, if new construction is not going forward, taxpayers soon begin to stir things up.

Quite natural that so many road commissioners lean toward a Tarvia program. For Tarvia enables them to point to sound economies effected—to savings in first cost and maintenance and savings on equipment.

In brief, the experience of hundreds of road officials has proved conclusively that for the money spent Tarvia gives more miles and the most years of satisfactory highway service.

The Barrett Company

New York	Chicago	Philadelphia	Boston
St. Louis	Cleveland	Cincinnati	Pittsburgh
Detroit	Kansas City	Birmingham	Dallas
Minneapolis	Salt Lake City	Bethlehem	Lebanon
Youngstown	Milwaukee	Toledo	Columbus
Baltimore	Syracuse	New Orleans	Rochester
Providence			Buffalo

In Canada:

THE BARRETT COMPANY, Limited

Montreal	Toronto	St. John, N. B.
Winnipeg	Vancouver	Halifax, N. S.

Tarvia
For Road Construction Repair and Maintenance

CRANES, LOCOMOTIVE
*Bay City Dredge Wks., Bay City, Mich.
*Byers Machine Co., Ravenna, O.
*Harnischfeger Corp., Milwaukee, Wis.
*Koehring Co., Milwaukee, Wis.
*Osgood Co., The, Marion, O.
*Thew Shovel Co., Lorain, O.
American Hoist & Derrick Co., St. Paul, Minn.
Brown Hoisting Mchy. Co., Cleveland, O.
Browning Co., Cleveland, O.
Bucyrus Co., South Milwaukee, Wis.
Davenport Locomotive Works, Davenport, Ia.
Erie Steam Shovel Co., Erie, Pa.
Hanna Eng. Works, Chicago, Ill.
Industrial Works, Bay City, Mich.
Link-Belt Co., Chicago, Ill.
Locomotive Crane Co. of America, Champaign, Ill.
Marion Steam Shovel Co., Marion, O.
McMyler Interstate Co., Cleveland, O.
Northwest Engineering Works, Chicago, Ill.
Orton & Steinbrenner Co., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, O.
U. S. Crane Co., Chicago, Ill.

CRANES, OVERHEAD TRAVELING
*Curtis Pneumatic Mchy. Co., St. Louis, Mo.
*Harnischfeger Corp., Milwaukee, Wis.
*Industrial Plants Corp'n, Toledo, O.
Alliance Machine Co., Alliance, O.
Chesapeake Iron Wks., Baltimore, Md.
Chisholm-Moore Mfg. Co., Cleveland, Ohio.
Milwaukee Electric Crane Co., Milwaukee, Wis.
Morgan Engineering Co., Alliance, O.
Northern Eng. Works, Detroit, Mich.
Shaw Crane Works, Muskegon, Mich.
Shepard Elec. Cr. & Hst. Co., Montour Falls, N.Y.
Toledo Crane Co., Bucyrus, O.
Whiting Fdry. & Equip. Co., Harvey, Ill.

CRANES, TRUCK
*Byers Machine Co., Ravenna, Ohio
*Harnischfeger Corp., Milwaukee, Wis.
*Industrial Plants Corp'n, Toledo, O.
Bay City Fdry. & Mach. Co., Bay City, Mich.
Universal Crane Co., Cleveland, Ohio

CRANES, WRECKING
Bucyrus Co., South Milwaukee, Wis.
Industrial Works, Bay City, Mich.

CREOSOTED BLOCKS, TIMBER, ETC.
American Creosoting Co., Inc., New York.
American Creosote Works, Inc., N. Orleans, La.
Carter Bloxonend Flooring Co., Kansas City, Mo.
Colonial Creosoting Co., Inc., New York.
Creosoted Materials Co., New Orleans, La.
Georgia Creosoting Co., New York.
Jennison-Wright Co., Toledo, O.
Midland Creosoting Co., Granite City, Ill.
Republic Creosoting Co., Indianapolis, Ind.
Southern Wood Pres. Co., Atlanta, Ga.
Wyckoff Pipe & Creosoting Co., New York.

CREOSOTING AND CREOSOTING OILS
*Barrett Co., New York
Am. Creosote Wks., Inc., New Orleans, La.
American Tar Products Co., Chicago, Ill.
Jennison-Wright Co., Toledo, O.
Southern Creosoting Co., Ltd., Slidell, La.
Southern Paving Const. Co., Chattanooga, Tenn.
Wyckoff Pipe & Creosoting Co., New York.

CRUSHERS, HEAVY DUTY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Buchanan Co., O. G., New York.
Traylor Eng. & Mfg. Co., Allentown, Pa.

CRUSHERS, ROCK
*Acme Road Machy. Co., Frankfort, N. Y.
*Austin-Western Road Mach. Co., Chicago, Ill.
*Good Roads Machy. Co., Kennett Square, Pa.
*Russell Grader Mfg. Co., Minneapolis, Minn.
*Universal Road Machinery Co., Kingston, N. Y.
Gallon Iron Works & Mfg. Co., Galion, Ohio
Morgan Engineering Co., Alliance, O.
New Holland Mach. Co., New Holland, Pa.
Smith Eng. Wks., Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Universal Crusher Co., Cedar Rapids, Ia.

CULVERTS, CAST IRON
*U. S. C. I. Pipe & Fdry. Co., Burlington, N. J.
American Cast Iron Pipe Co., Birmingham, Ala.
Gilbert Mfg. Co., Aberdeen, S. D.
Wood & Co., R. D., Philadelphia, Pa.

CULVERTS, CORRUGATED METAL
*Austin-Western Rd. Mach. Co., Chicago, Ill.
*Good Roads Machinery Co., Kennett Square, Pa
*Newport Culvert Co., Newport, Ky.
Canton Culvert & Silo Co., Canton, O.
Florida Metal Products Co., Jacksonville, Fla.
Galion Iron Works & Mfg. Co., Galion, Ohio
Gilbert Mfg. Co., Aberdeen, S. D.
Hardesty Mfg. Co., The R., Denver, Colo.
Klauer Mfg. Co., Dubuque, Ia.
Lyle Culv. & Rd. Equip. Co., Minneapolis, Minn
Northfield Iron Co., Northfield, Minn.
Southern Metal Culvert Co., Salisbury, N. C.
Wheeling Corrugating Co., Wheeling, W. Va.

CULVERT FORMS
Concrete Form Co., Inc., Syracuse, N. Y.
Northfield Iron Co., Northfield, Minn.

CURB BOXES
*Clark Co., H. W., Matteson, Ill.
Casey-Hedges Co., Chattanooga, Tenn.
Clow & Sons, J. B., Chicago, Ill.
Madison Foundry Co., Cleveland, O.
Mueller Co., Decatur, Ill.

CURB GUARDS, STEEL
*Godwin Co., W. S., Baltimore, Md.

CURB, STEEL PROTECTED
*Truscon Steel Co., Youngstown, O.
Concrete Steel Co., New York.
Steel Protected Concrete Co., Philadelphia, Pa

CURING OF CONCRETE
*Dow Chemical Co., Midland, Mich.
*Solvay Process Co., New York

CUTTERS, PIPE, HAND
Armstrong Mfg. Co., Bridgeport, Conn.
Barnes Tool Co., New Haven, Conn.
Erie Tool Works, Erie, Pa.
Greenfield Tap & Die Corp'n., Greenfield, Mass
Oswego Tool Co., Oswego, N. Y.
Reed Mfg. Co., Erie, Pa.
Walworth Mfg. Co., Boston, Mass.

CUTTERS, ROD AND WIRE
*Koehring Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Carolus Mfg. Co., Sterling, Ill.
Helwig Mfg. Co., St. Paul, Minn.
Worthington Pump & Mchy. Corp., New York.

CUTTING EDGES
*Adams & Co., J. D., Indianapolis, Ind.
Shunk Mfg. Co., Bucyrus, O.

CUTTING AND WELDING APPARATUS
*Milburn Co., Alexander, Baltimore, Md.
MacLeod Co., Cincinnati, O.

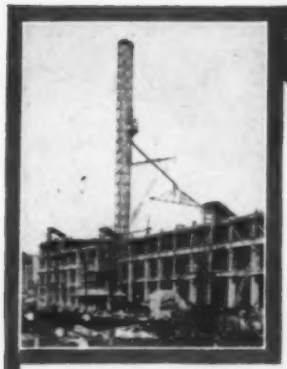
DERRICKS, GUY AND STIFF-LEG
*Clyde Iron Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
*Flory Mfg. Co., S., Bangor, Pa.
*Insley Mfg. Co., Indianapolis, Ind.
*Lidgerwood Manufacturing Co., New York
*Sasgen Derrick Co., Chicago, Ill.
American Hoist & Derrick Co., St. Paul, Minn.
Federal Bridge & Struc. Co., Waukesha, Wis.
Horton Co., John T., New York.
Lakeside Bridge & Steel Co., N. Milwaukee, Wis
National Hoisting Engine Co., Harrison, N. J.
Superior Iron Works, Superior, Wis.

DERRICKS, PIPE LAYING
*Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
*Lidgerwood Manufacturing Co., New York
Austin Machinery Corp'n, Muskegon, Mich.
Mueller Co., Decatur, Ill.

DERRICKS, REVOLVING
*Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
*Clyde Iron Wks. Sales Co., Duluth, Minn.
*Lidgerwood Manufacturing Co., New York

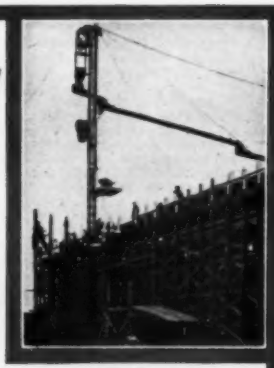
DERRICKS, STEEL
*Clyde Iron Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
*Insley Mfg. Co., Indianapolis, Ind.
*Lidgerwood Manufacturing Co., New York
American Hoist & Derrick Co., St. Paul, Minn.
Hayward Co., New York.
Lakeside Bridge & Steel Co., N. Milwaukee, Wis.
Taylor Portable Steel Derrick Co., Chicago, Ill.

** Indicates that the manufacturer carries an advertisement.* *See index facing inside back cover.*



The Insley Steel Tower, Quick Shift, Counterweight Chute Plant

QUALITY



The Insley Mast Hoist Plant

QUALITY is a word which, while not ordinarily applied to construction equipment, should have a meaning to every contractor and construction firm.

It refers to equipment which has the refinements of design that go to make the difference between smooth, efficient, uninterrupted operation and the continued petty annoyances of equipment that is weak as regards small details and which will just get by.

Insley Equipment is Quality Equipment

THE INSLEY STEEL TOWER, QUICK SHIFT, COUNTERWEIGHT CHUTE PLANT is the recognized concrete placing plant for use on large construction projects.

THE INSLEY MAST HOIST PLANT is the last word by way of concrete placing equipment on jobs where a 7-s or 14-s mixer is used.

THE INSLEY EXCAVATOR is *the* machine of the light excavating field.

INSLEY MANUFACTURING COMPANY
Engineers and Manufacturers
INDIANAPOLIS

No. 46

The Insley Excavator as Used with Ditcher or Shovel Attachments

DERRICKS, STEEL PORTABLE

*Clyde Iron Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
*Lidgerwood Manufacturing Co., New York
American Hoist & Derrick Co., St. Paul, Minn.

DERRICKS, TRAVELING

*Bay City Dredge Works, Bay City, Mich.
*Clyde Iron Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
American Hoist & Derrick Co., St. Paul, Minn.
Austin Machinery Corp'n, Muskegon, Mich.
Hayward Co., New York.
Nat'l Hoisting Engine Co., Harrison, N. J.
Orton & Steinbrenner Co., Chicago, Ill.

DERRICK FITTINGS

*S. Flory Mfg. Co., Bangor, Pa.

DIESEL ENGINES. (See Engines, Oil)

DISTRIBUTORS, TAR AND ASPHALT

*Kinney Mfg. Co., Boston, Mass.

DISTRIBUTING PLANTS, CONCRETE

*Archer Iron Works, Chicago, Ill.
*Lakewood Engineering Co., Cleveland, O.
*Insley Mfg. Co., Indianapolis, Ind.
Ransome Concrete Mchy. Co., Dunellen, N. J.

DITCHING MACHINES. (See Excavators, Ditch and Trench)

DIVIDING PLATES (ROAD)

*Godwin Co., W. S., Baltimore, Md.

DOORS AND SHUTTERS, STEEL ROLLING

Cornell Iron Works, Inc., New York.
Kinnear Mfg. Co., Columbus, O.
Variety Fire Door Co., Chicago, Ill.
Wilson Corp., J. G., New York.

DRAFTING MACHINES

Universal Drafting Machine Co., Cleveland. O.

DRAINAGE TOOLS

*Oliver Ames & Sons Corp., North Easton, Mass.
*Ames Shovel & Tool Co., Boston, Mass.
*Geo. Griffiths Co., Cheltenham, Pa.
*The H. M. Myers Co., Beaver Falls, Pa.
*T. Rowland's Sons, Inc., Cheltenham, Pa.
*St. Louis Shovel Co., Plant, St. Louis, Mo.
*Wright Shovel Co., Anderson, Ind.

DREDGES

*Bay City Dredge Works, Bay City, Mich.
*Lidgerwood Manufacturing Co., New York
*Michigan Dredge Co., Bay City, Mich.
*Osgood Co., The, Marion, O.
American Steel Dredge Co., Fort Wayne, Ind.
Bucyrus Co., South Milwaukee, Wis.
Ellicott Machine Corp'n, Baltimore, Md.
Erie Steam Shovel Co., Erie, Pa.
Hayward Co., New York.
Marion Steam Shovel Co., Marion, O.
Stockton Iron Works, Stockton, Cal.
Street Bros. Machine Works, Chattanooga, Tenn.
Superior Iron Works, Superior, Wis.

DREDGES, DIPPER

*Bay City Dredge Works, Bay City, Mich.
*Osgood Co., Marion, O.
American Steel Dredge Co., Fort Wayne, Ind.
Austin Machinery Corp'n, Muskegon, Mich.
Bucyrus Co., South Milwaukee, Wis.
Fairbanks Steam Shovel Co., Marion, O.
Marion Steam Shovel Co., Marion, O.

DREDGES, HYDRAULIC

Bucyrus Co., South Milwaukee, Wis.
Ellicott Mach. Corp., Baltimore, Md.
Fairbanks Steam Shovel Co., Marion, O.
Marion Steam Shovel Co., Marion, O.
Morris Machine Works, Baldwinsville, N. Y.

DREDGING MACHINERY

*S. Flory Mfg. Co., Bangor, Pa.

DREDGING PUMPS AND ACCESSORIES

Erie Pump & Engine Wks., Medina, N. Y.

DRILLS, AIR AND ROCK

*Dallett Co., The, Philadelphia, Pa.
*Denver Rock Drill Mfg. Co., Denver, Colo.
*McKiernan-Terry Drill Co., New York.
*Sullivan Machinery Co., Chicago, Ill.
*Wood Drill Wks., Paterson, N. J.
Chicago Pneumatic Tool Co., New York.
Cleveland Pneumatic Tool Co., Cleveland, Ohio.
Cleveland Rock Drill Co., Cleveland, Ohio.
Helwig Mfg. Co., St. Paul, Minn.
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., New York.

DRILLS, CORE

*McKiernan-Terry Drill Co., New York.
*Standard Diamond Drill Co., Chicago, Ill.
*Sullivan Machinery Co., Chicago, Ill.
Dobbins Core Drill Co., Inc., New York.
Ingersoll-Rand Co., New York.

DRILLS, HAMMER (PNEUMATIC)

*Denver Rock Drill Mfg. Co., Denver, Colo.
*McKiernan-Terry Drill Co., New York.
*Sullivan Machinery Co., Chicago, Ill.
*Wood Drill Works, Paterson, N. J.
Chicago Pneumatic Tool Co., New York.
Cleveland Pneumatic Tool Co., Cleveland, O.
Cleveland Rock Drill Co., Cleveland, O.
Helwig Mfg. Co., St. Paul, Minn.
Ingersoll-Rand Co., New York.

DRILLS FOR WELLS AND BLAST HOLES

(See Well Drilling Machinery)

DRUMS, HOLDING

*Blaw-Knox Co., Pittsburgh, Pa.
*Clyde Iron Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
Hayward Co., New York.
Monighan Machine Co., Chicago, Ill.

DRYERS, ASPHALT AND CEMENT

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Blower Co., Detroit, Mich.
American Process Co., New York.
Atlas Dryer Co., Cleveland, O.
Bartlett & Snow Co., C. O., Cleveland, O.
Cummer & Son Co., F. D., Cleveland, O.
Ruggles-Coles Eng. Co., New York.

DRYERS, SAND AND GRAVEL

*Aeroil Burner Co., Union Hill, N. J.
*Littleford Bros., Cincinnati, Ohio.
Bartlett & Snow Co., C. O., Cleveland, Ohio.
Chase & Lyman, Boston, Mass.

DUMP BODIES FOR MOTOR TRUCKS

*Archer Iron Works, Chicago, Ill.
*Heil Company, Milwaukee, Wis.
*Herr Dump Car Mfg. Co., Coatesville, Pa.
*The Hug Co., Highland, Ill.
*Hughes-Keenan Co., Mansfield, Ohio
*Insley Mfg. Co., Indianapolis, Ind.
*Littleford Bros., Cincinnati, O.
*Mack Trucks, Inc., New York.
*Marion Steel Body Co., Marion, Ohio
*Superior Body Corpn., Marion, Ind.
*Stewart Iron Wks. Co., Cincinnati, Ohio
*Wood Hydr. Hoist & Body Co., Detroit, Mich.
Columbia Body Corp., Columbia, Pa.
Columbian Steel Tank Co., Kansas City, Mo.
Ditwiler Mfg. Co., Galion, Ohio
Easton Car & Const'n Co., Easton, Pa.
Galion All Steel Body Co., Galion, Ohio.
Griscom-Russell Co., New York.
Jennings Automatic Dump Body, Roanoke, Va.
Lee Trailer & Body Co., Chicago, Ill.
Mandt Body Co., Keokuk, Iowa.
Pechstein Iron Works, Keokuk, Iowa.
Van Dorn Iron Wks., Cleveland, Ohio.

DUMP CARTS AND WAGONS, HORSE DRAWN

*Acme Road Machinery Co., Frankfort, N. Y.
*Austin-Western Road Machy. Co., Chicago, Il
*La Plant-Choate Mfg. Co., Cedar Rapids, Ia.
*Russell Grader Mfg. Co., Minneapolis, Minn.

P & H 206 on City Excavation Work

Where Speed is Demanded

Where all construction work is done under pressure—in the city—the fast work, the powerful crowding of the dipper throughout its travel, right up through the top of the bank, are of prime importance.

The P & H Shovel loads trucks on top of the bank—again speeding up the work. And with the P & H dipper stick design and control the floor of the excavation can be leveled uniformly.

There are no delays in getting started, no fuel is used needlessly because of the ease of starting and stopping.

Power Clutch Control

The latest in Excavator control—the operator of a P&H simply moves the levers with a slight pull and engine power does the rest—less fatigue, greater speed of handling and larger output.

No Smoke to Foul the Air

With gasoline or electric motor drive there is no smoke and soot nuisance—no bulky fuel to handle—no fire hazard.

That these advantages are also important is evidenced by the increased use of P & H Excavators for excavating and street grading in cities.

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Successor to
PAWLING & HARNISCHFEGER CO.
Established in 1884
3819 National Ave., Milwaukee, Wis.

New York, Detroit, Kansas City, Jacksonville, Chicago, Portland, Birmingham, Memphis, Dallas, Seattle, Philadelphia, Pittsburgh, Minneapolis, Los Angeles, San Francisco

Warehouses and Service Stations: New York, Memphis, Jacksonville, San Francisco, Seattle, Los Angeles

P&H GASOLINE SHOVEL

*Western Wheeled Scraper Co., Aurora, Ill.
Acme Wagon Co., Emigsville, Pa.
Austin Mfg. Co., Chicago, Ill.
Columbia Body Corp., Columbia, Pa.
Convertible Wagon-Trailers, Inc., Buffalo, N. Y.
Eagle Wagon Works, Auburn, N. Y.
Gilbert Mfg. Co., Aberdeen, S. D.
Holsbog & Bro., Geo. H., Jeffersonville, Ind.
Little Red Wagon Co., Omaha, Neb.
Stockland Road Mach'y Co., Minneapolis, Minn.
Watson Products Corp., Canastota, N. Y.

DUST LAYING (CALCIUM CHLORIDE)

*Dow Chemical Co, Midland, Mich.
*Solvay Process Co., New York
Carbondale Calcium Co., Carbondale, Pa.

DYNAMITE (See Explosives)

EJECTORS, SEWAGE (See Sewage Ejectors)

ELECTRIC GENERATORS AND MOTORS

Louis Allis Co., Milwaukee, Wis.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Crocker-Wheeler Co., Ampere, N. J.
Fairbanks, Morse & Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Idea Elec. & Mfg. Co., Mansfield, O.
Lincoln Electric Co., Cleveland, O.
Robbins & Myers Co., Springfield, O.
Triumph Electric Co., Cincinnati, O.
Wagner Elec. Mfg. Co., St. Louis, Mo.
Western Electric Co., New York.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

ELECTRIC LAMPS

General Electric Co., Schenectady, N. Y.
Westinghouse Lamp Co., New York.

ELECTRIC LIGHTING PLANTS

*Climax Engineering Co., Clinton, Ia
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Fairbanks, Morse & Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Universal Motor Co., Oshkosh, Wis.
Westinghouse Elec. & Mfg. Co., E. Pittsb'gh, Pa.
Western Electric Co., New York.

ELECTRIC SUPPLIES, METERS, ETC.

General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsb'gh, Pa.

ELECTRIC TRANSFORMERS

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Kuhlman Electric Co., Bay City, Mich.
Westinghouse Elec. & Mfg. Co., E. Pittsb'gh, Pa.

ELECTRIC WIRES AND CABLES. (See "Wire and Cable")

ELEVATORS, BUCKET

*Atlas Eng. Co., Milwaukee, Wis.
*Austin-Western Road Machy. Co., Chicago, Ill.
*Good Roads Mach'y Co., Kennett Square, Pa.
*Haiss Mfg. Co., Geo., New York.
*Littleford Bros., Cincinnati, Ohio.
*Russell Grader Mfg. Co., Minneapolis, Minn.
*Spears-Wells Mach'y Co., Oakland, Cal.
*Universal Road Machinery Co., Kingston, N. Y.
Austin Mfg. Co., Chicago, Ill.
Bartlett & Snow Co., C. O., Cleveland, O.
Chain Belt Co., Milwaukee, Wis.
Fairfield Engineering Co., Marion, Ohio
Gifford-Wood Co., Hudson, N. Y.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago, Ill.
Olson & Co., Sam'l, Chicago, Ill.
Robins Conv. Belt Co., New York.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.
Worthington Pump & Mchy. Corp., New York.

ELEVATORS, PASSENGER, FREIGHT, ETC.

Amer. Elevator & Mach. Co., Louisville, Ky.
Atlantic Elevator Co., Inc., Philadelphia, Pa.
Bay State Elevator Co., Springfield, Mass.
Haughton Elev. & Mach. Co., Toledo, Ohio.
Kaestner & Hecht Co., Chicago, Ill.
Llewellyn Iron Works, Los Angeles, Cal.
Montgomery Elevator Co., Moline, Ill.
Otis Elevator Co., New York.
Ridgway & Son Co., C., Coatesville, Pa.
See Elec. Elevator Co., A. B., New York.
Speidel, J. G., Reading, Pa.
Warner Elevator Mfg. Co., Cincinnati, O.
Warsaw Elevator Co., Warsaw, N. Y.

ENGINES, GAS AND GASOLINE

*Alamo Engine Co., Hillsdale, Mich.
*Climax Engineering Co., Clinton, Ia.
*Domestic Engine & Pump Co., Shippensburg, Pa.
*Evinrude Motor Co., Milwaukee, Wis.
*Hercules Corpn., Evansville, Ind.
*Hinkley Motors, Inc., Detroit, Mich.
*Turner & Moore Mfg. Co., Detroit, Mich.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Buda Co., Harvey, Ill.
C. H. & E. Manufacturing Co., Milwaukee, Wis
Caterpillar Tractor Co., Peoria, Ill.
Charter Gas Eng. Co., Sterling, Ill.
Chicago Pneumatic Tool Co., New York.
Cook Motor Co., Delaware, Ohio
Fairbanks, Morse & Co., Chicago, Ill.
Foos Gas Engine Co., Springfield, Ohio.
Fuller & Johnson Mfg. Co., Madison, Wis.
Gade Bros. Mfg. Co., Iowa Falls, Iowa.
Hercules Motors Corp., Canton, O.
John Lauson Mfg. Co., New Holstein, Wis.
Le Roi Co., Milwaukee, Wis.
"New-Way" Motor Co., Lansing, Mich.
Novo Engine Co., Lansing, Mich.
Sterling Engine Co., Buffalo, N. Y.
Universal Motor Co., Oshkosh, Wis.
Weber Engine Co., Kansas City, Mo.
Wellman-Seaver-Morgan Co., Cleveland, O.
Worthington Pump & Mchy. Corp., New York

ENGINES, HOISTING
(See Hoists)

ENGINES, KEROSENE

*Alamo Engine Co., Hillsdale, Mich.
*Climax Engineering Co., Clinton, Iowa

ENGINES, OIL

DIESEL

*Hadfield-Penfield Steel Co., Bucyrus, Ohio
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Busch-Sulzer Bros.-Diesel Eng. Co., St. Louis, Mo.
Fulton Iron Works Co., St. Louis, Mo.
McIntosh & Seymour Corp., Auburn, N. Y.
Nordberg Mfg. Co., Milwaukee, Wis.
St. Mary's Oil Eng. Co., St. Charles, Mo.
Western Machy. Co., Los Angeles, Cal.

SEMI-DIESEL

Anderson Fdry. & Mach. Co., Anderson, Ind.
Bessemer Gas Eng. Co., Grove City, Pa.
Buckeye Machinery Co., Lima, O.
Charter Gas Eng. Co., Sterling, Ill.
Chicago Pneumatic Tool Co., New York.
De La Vergne Machine Co., New York.
Fairbanks, Morse & Co., Chicago, Ill.
Foos Gas Engine Co., Springfield, Ohio.
Ingersoll-Rand Co., New York.
Midwest Engine Co., Indianapolis, Ind.
Muncie Oil Eng. Co., Muncie, Ind.
Nordberg Mfg. Co., Milwaukee, Wis.
Stover Mfg. & Engine Co., Freeport, Ill.
Taylor Machine Co., Cleveland, O.
Weber Engine Co., Kansas City, Mo.
Worthington Pump & Mchy. Corp., New York

ENGINES, PUMPING

*Climax Engineering Co., Clinton, Ia.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Hooven, Owens, Rentschler Co., Hamilton, O.
Murray Iron Wks., Burlington, Ia.
Nordberg Mfg. Co., Milwaukee, Wis.
Worthington Pump & Mchy. Corp., New York.

ENGINES, STEAM

*Dake Engine Co., Grand Haven, Mich.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Erie-Ball Engine Co., Pittsburgh, Pa.
Filer-Stowell Co., Milwaukee, Wis.
Hardie-Tynes Mfg. Co., Birmingham, Ala.
Leffel Co., J., Springfield, O.
Morris Machine Works, Baldwinsville, N. Y.
Murray Iron Works Co., Burlington, Ia.
Norberg Mfg. Co., Milwaukee, Wis.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Vilter Mfg. Co., Milwaukee, Wis.

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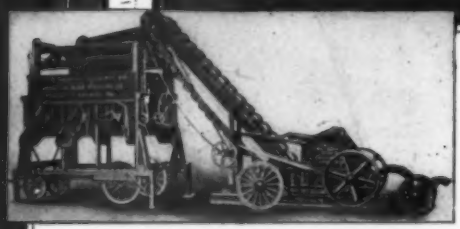
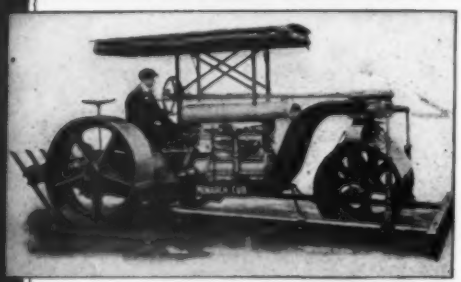
Use GOOD ROADS MACHINERY



The Champion Steel Rock Crusher, mounted, with Elevator, Screen and Bin, is the ideal rock crushing plant for towns, townships, counties, cities and contractors. Large in capacity—low in upkeep cost. Built in many different sizes.



The Monarch Cub Roller is a complete road building outfit in one unit. Low in first cost, and economical in operation, the Monarch Cub Roller with scarifier and planer attachment will prove to be an economical investment wherever roads are to be built or maintained.

The Champion Heating Distributor, for mounting on motor trucks, will apply any kind of bituminous materials, light, medium, or heavy. Material can be heated quickly and applied in any quantity desired. Made in 600, 800, and 1000 gallon sizes.

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"Everything for the Road Maker"

· Road Graders · Road Crushers · Road Rollers · Oiling Machines · Road Drags ·
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The
GOOD ROADS MACHINERY Co
INC.
KENNETT SQUARE, PA.

ENGINES, SWINGING
*Dake Engine Co., Grand Haven, Mich.

EXCAVATING MACHINERY. (See Names Under Excavators, also Steam Shovels)

EXCAVATORS, CABLEWAY
*American Mfg. & Eng. Co., Kalamazoo, Mich.
*Lidgerwood Mfg. Co., New York.
Bucyrus Co., South Milwaukee, Wis.

EXCAVATORS, DITCH AND TRENCH
*Barber-Green Co., Aurora, Ill.
*Bay City Dredge Wks., Bay City, Mich.
*Byers Machine Co., Ravenna, Ohio.
*Clyde Iron Wks. Sales Co., Duluth, Minn.
*Harnischfeger Corp., Milwaukee, Wis.
*Insley Mfg. Co., Indianapolis, Ind.
*Keystone Driller Co., Beaver Falls, Pa.
*Osgood Co., The, Marion, O.
*Russell Grader Mfg. Co., Minneapolis, Minn.
American Hoist & Derrick Co., St. Paul, Minn.
Austin Machinery Corp'n, Muskegon, Mich.
Buckeye Traction Ditcher Co., Findlay, Ohio.
Bucyrus Co., South Milwaukee, Wis.
Economy Excavator Co., Iowa Falls, Ia.
Erie Steam Shovel Co., Erie, Pa.
Fairbanks Steam Shovel Co., Marion, O.
Hayward Co., The, New York City.
Marion Steam Shovel Co., Marion, O.
Monighan Machine Co., Chicago, Ill.
Owensboro Ditcher & Grader Co., Owensboro, Ky.
Parsons Co., Newton, Ia.
Topping Machy. Co., Chas. T. Dayton, O.

EXCAVATORS, DRAG-LINE
*Bay City Dredge Works, Bay City, Mich.
*Byers Machine Co., Ravenna, Ohio.
*Clyde Iron Wks. Sales Co., Duluth, Minn.
*Harnischfeger Corp., Milwaukee, Wis.
*Osgood Co., The, Marion, O.
*Russell Grader Mfg. Co., Minneapolis, Minn.
*Sauerman Bros., Chicago, Ill.
*Smith Co., T. L., Milwaukee, Wis.
Austin Machinery Corp'n, Muskegon, Mich.
Galion Iron Works & Mfg. Co., Galion, Ohio
Browning Co., Cleveland, O.
Bucyrus Co., South Milwaukee, Wis.
Economy Excavator Co., Iowa Falls, Ia.
Erie Steam Shovel Co., Erie, Pa.
Gade Excavator Works, C. L., Iowa Falls, Iowa.
Green, L. P., Chicago, Ill.
Hayward Co., New York.
Industrial Works, Bay City, Mich.
Link-Belt Co., Chicago, Ill.
Marion Steam Shovel Co., Marion, O.
Monighan Machine Co., Chicago, Ill.

EXPANDED METAL
*Truscon Steel Co., Youngstown, O.
Berger Mfg. Co., Canton, O.
Consolidated Expanded Metal Co., Braddock, Pa.
Kalman Steel Co., Chicago, Ill.
Northwestern Expanded Metal Co., Chicago, Ill.
Youngstown Pressed Steel Co., Warren, O.

EXPANSION JOINT MATERIAL
*Barber Asphalt Co., Philadelphia, Pa.
*Barrett Co., New York
*Carey Co., Philip, Cincinnati, Ohio.
*Texas Company, New York.
*Truscon Steel Co., Youngstown, O.
Hoosier Asphalt Co., Alexandria, Ind.
Pioneer Asphalt Co., Lawrenceville, Ill.
Servicised Product Corp., Chicago, Ill.
Waring-Underwood Co., Philadelphia, Pa.

EXPLOSIVES
Atlas Powder Co., Wilmington, Del.
Du Pont de Nemours & Co., E.I., Wilmington, Del.
Giant Powder Co., Cons., San Francisco, Cal.
Grasselli Powder Co., Cleveland, O.
Hercules Powder Co., Wilmington, Del.

FENCING
*Stewart Iron Works Co., Cincinnati, Ohio
*Wickwire Spencer Steel Corp., New York.
Adrian Wire Fence Co., Adrian, Mich.
American Steel & Wire Co., Chicago, Ill.
Anchor Post Iron Works, New York.
Cyclone Fence Co., Waukegan, Ill.
Frost-Superior Fence Co., Warren, Ohio
Indiana Steel & Wire Co., Muncie, Ind.
Nitselman Bros., Muncie, Ind.
Michigan Wire Fence Co., Adrian, Mich.
Page Steel & Wire Prod. Corp., Bridgeport, Conn.
Pittsburgh Steel Co., Pittsburgh, Pa.
Texas Cyclone Fence Co., Fort Worth, Tex.
Youngstown Sheet & Tube Co., Youngstown, O.

FILING EQUIPMENT, STEEL
Art Metal Constr. Co., Jamestown, N. Y.
Berger Mfg. Co., Canton, O.
General Fireproofing Co., Youngstown, O.
Van Dorn Iron Works, Cleveland, O.

FILTERS, OIL
Bowser & Co., Inc., S. F., Fort Wayne, Ind.
Wayne Tank & Pump Co., Ft. Wayne, Ind.

FILTERS, WATER
American Water Softener Co., Philadelphia, Pa.
Graver Corporation, E. Chicago, Ind.
International Filter Co., Chicago, Ill.
Norwood Engineering Co., Florence, Mass.
Roberts Filter Co., Darby, Pa.
Scaife & Sons Co., W. B., Pittsburgh, Pa.

FIRE ALARM SYSTEMS
Gamewell Co., Newton Upper Falls, Mass.

FIRE ALARM SIRENS
*Union Water Meter Co., Worcester, Mass.
Erick Elec. Siren Co., St. Paul, Minn.
Federal Sign System, Chicago, Ill.
Hendrie & Bolthoff Mfg. & Sup. Co., Denver, Col
Sterling Siren Fire Alarm Co., Rochester, N. Y.

FIRE APPARATUS, MOTOR
*Mack Trucks, Inc., New York.
Ahrens-Fox Fire Engine Co., Cincinnati, O.
American-La France Fire Eng. Co., Elmira, N. Y.
Brockway Motor Fire App. Co., Cortlandt, N. Y.
Foamite-Childs Corp., Utica, N. Y.
Hale Fire Pump Co., Conshohocken, Pa.
Northern Fire Apparatus Co., Minneapolis, Minn.
Obenchain-Boyer Co., Logansport, Ind.
Pirsch & Sons Co., Peter, Kenosha, Wis.
Prospect Fire Engine Co., Prospect, O.
Seagrave Co., Columbus, O.
Stutz Fire Engine Co., Indianapolis, Ind.
Waterous Fire Engine Works, St. Paul, Minn.

FIRE EXTINGUISHERS, CHEMICAL
American-La France Fire Eng. Co., Elmira, N. Y.
Buffalo Fire Appliance Corp., Buffalo, N. Y.
Cross Mfg. Co., C. J., Inc., New York.
Foamite-Childs Co., Utica, N. Y.
Pyrene Mfg. Co., Newark, N. J.

FIRE HOSE (See Hose, Fire)

FIREPROOF BUILDING MATERIAL
*Truscon Steel Co., Youngstown, O.
Berger Mfg. Co., Canton, O.
Detroit Steel Prod. Co., Detroit, Mich.
General Fireproofing Co., Youngstown, O.
Kalman Steel Co., Chicago, Ill.
Keasbey & Mattison Co., Ambler, Pa.
Kinnear Mfg. Co., Columbus, O.
National Fireproofing Co., Pittsburgh, Pa.
United States Gypsum Co., Chicago, Ill.
Youngstown Pressed Steel Co., Warren, O.

FIRST AID EQUIPMENT
American-La France Fire Eng. Co., Elmira, N. Y.

FLEXIBLE JOINTS
*Central Foundry Co., New York
*U. S. C. I. Pipe & Fdry Co., Burlington, N. J.
Coldwell-Wilcox Co., Newburgh, N. Y.
Crane Co., Chicago, Ill.
United Lead Company, New York.

FLOORING, COMPOSITION
*Barber Asphalt Co., Philadelphia, Pa.
*Barrett Co., New York
Am. Mason Safety Tread Co., Lowell, Mass.
Johns-Manville, Inc., New York.
Marino Decking & Supply Co., Phila., Pa.
Muller, Franklyn R., & Co., Waukegan, Ill.

FLOORS, WOOD BLOCK
*Barrett Co., New York.
Carter Bloxonend Flooring Co., Kansas City, Mo

Jaeger
A MIX A MINUTE

THE 5L-CT Jaeger shown illustrated on the left is the famous One-Sack Jaeger Mixer with Power Loader, which increases the output of a mixer 50 to 75%. While one batch is being mixed, another is being assembled. The 5-L is also equipped with the exclusive Jaeger Tip Over Accurate Measure Water Tank and the Gravity or Balanced Device described below.

Jaeger Mixers—The First Choice of 30,000 Contractors!

JAEGER Service has placed Jaeger Mixers in the forefront of all concrete mixers. Chosen by thousands of contractors for every type of construction work, the Jaeger is backed by the reputation—character—and resources of an internationally known organization. **Every Jaeger sold means that a contractor has bought guaranteed service and satisfaction.**

12 EXTRA BATCHES AN HOUR

THAT is what it means to use a Jaeger Mixer on every job. The Jaeger Automatic Dumping Device tilts the drum from the revolving position to discharge position in less than two seconds. It returns it to the mixing position in the same time. You save 10 seconds on every batch —twelve extra batches an hour. Think what that means in time and money saved on every job.

The Jaeger Tilting Drum is built to turn out the most thorough mix in the shortest possible time. Its especially designed paddles slice through the batch turning it back on flat spots exactly placed to force the materials forward and complete a perfect mix.

Jaeger's Volume Production Means Lower Prices!

The huge Jaeger Plant builds one thing exclusively—the best concrete mixers made. And this specialization means volume purchases—increased factory efficiency—lower overhead—international sales outlets—and lower prices. **Every contractor can buy the Original Jaeger Tilting-Drum Mixer at the same or lower prices than machines which are distinctly inferior.**

Write us today for catalog and the name of the Jaeger dealer in your town.

JAEGER BUILDS 36 DIFFERENT MIXING OUTFITS ALL JAEGER MIXERS COMPLY WITH THE A. G. C. STANDARDS OF GUARANTEED WORKING CAPACITY.

ALL TILTING DRUM MIXERS

are not Jaegers. "The Jaeger" is far superior to any mixer made, and should not be confused with inferior machines, even though they be of the tilting-drum type. Protect yourself by getting the "genuine Jaeger." Look for the name on the drum, and the flat spots inside. Write us for the name of the distributor nearest you.

STOCKS CARRIED IN PRINCIPAL CITIES.

The Jaeger Machine Company

701 DUBLIN ROAD **COLUMBUS, OHIO.**

Jennison-Wright Co., Toledo, O.
Midland Creosoting Co., Toledo, O.
Republic Creosoting Co., Indianapolis, Ind.
Sou. Wood Preserving Co., Atlanta, Ga.
Wyckoff Pipe & Creosoting Co., New York.

FLUSH TANKS
*Pacific Flush Tank Co., Chicago and New York

FLUSHERS, STREET. (See Street Flushers and Sprinklers.)

FORD AND FORDSON EQUIPMENT

AIR COMPRESSORS FOR FORDSONS
*Curtis Pneumatic Machinery Co., St. Louis, Mo.
Schramm, Inc., Westchester, Pa.

AIR COMPRESSORS FOR FORD TRUCKS
*Domestic Engine & Pump Co., Shippensburg, Pa.
Schramm, Inc., Westchester, Pa.

CONCRETE MIXERS ON FORD TRUCKS
*American Cement Machine Co., Keokuk, Iowa
*Archer Iron Works, Chicago, Ill.
Milwaukee Concrete Mixer Co., Milwaukee, Wis.

DUMP BODIES FOR FORD TRUCKS
*Archer Iron Works, Chicago, Ill.
*Heil Co., Milwaukee, Wis.
*Herr Dump Body Mfg. Co., Coatesville, Pa.
*Hughes-Keenan Co., Mansfield, Ohio.
*Marion Steel Body Co., Marion, Ohio
*Stewart Iron Works Co., Cincinnati, Ohio
*Superior Boiler Works, Marion, Ind.
*Wood Hydr. Hoist & Body Co., Detroit, Mich.
American Production & Trading Co., Chicago, Ill.
Anthony Co., Streator, Ill.
Columbian Steel Tank Co., Kansas City, Mo.
Ditwiler Mfg. Co., Galion, Ohio
Eagle Wagon Works, Auburn, N. Y.
Easton Car & Const'n Co., Easton, Pa.
Galion All Steel Body Co., Galion, O.
Griscom-Russell, New York.
Jennings Auto. Dump Body Co., Roanoke, Va.
Lee Trailer & Body Co., Chicago, Ill.
Mandt Co., Keokuk, Iowa.
Martin-Parry Corp., York, Pa.
N. Y. Cent. Iron Wks. Co., Inc., Hagerstown, Md.
Pechstein Iron Works, Keokuk, Iowa.
Thompson Mfg. Co., Williston, S. C.
Van Dorn Iron Works, Cleveland, Ohio.

FORD MOTOR PUMPER
*American Steam Pump Co., Battle Creek, Mich.

FORD PLOWS
Roderick Lean Mfg. Co., Mansfield, Ohio.

FORD REPLACEMENT UNITS (AXLES AND TRANSMISSIONS)
*Hinckley Motors, Inc., Detroit, Mich.
*Ruckstell Sales & Mfg. Co., New York
Warford Corpn., New York

FORD SPECIAL BODIES
Standard Commercial Body Corp., B'klyn, N. Y.

FORD TRUCK EXTENSION FRAMES
Swedish Crucible Steel Co., Detroit, Mich.

FORDSON DITCHING MACHINE
Chas. T. Topping, Dayton, O.

FORDSON HOISTS
*Clyde Iron Works Sales Co., Duluth, Minn.
Ersted Machinery Mfg. Co., Portland, Oregon.
Oklahoma Eng. & Fdry. Co., Muskogee, Okla.
Otis Engine Corp., New York.
Sheffield Tool & Supply Co., Sheffield, Pa.

FORDSON INDUSTRIAL LOCOMOTIVES
Adamson Motor Co., Birmingham, Ala.
Brookville Truck & Tractor Co., Brookville, Pa.
Whitehead & Kales Co., Detroit, Mich.

FORDSON POWER SHOVELS
*Insley Manufacturing Co., Indianapolis, Ind.
Anthony Company, The, Streator, Ill.
Fairbanks Steam Shovel Co., Marion, Ohio
Glasgow Engineering Company, St. Louis, Mo.
Mandt Company, The, Keokuk, Iowa.
Milwaukee Electric Crane & Mfg. Co., Milwaukee, Wis.

FORDSON ROAD GRADERS
*Good Roads Machinery Co., Kennett Square, Pa.
*Hadfield-Penfield Steel Co., Bucyrus, Ohio
*Russell Grader Mfg. Co., Minneapolis, Minn.
*Shaw-Enochs Tractor Co., Minneapolis, Minn.
Adams, J. D. & Co., Indianapolis, Ind.
Gilbert Mfg. Co., Aberdeen, S. D.
Wehr Co., Milwaukee, Wis.

FORDSON ROAD ROLLERS
*Acme Road Mach'y Co., Frankfort, N. Y.
*Austin-Western Road Mach. Co., Chicago, Ill.
*Good Roads Machy. Co., Kennett Square, Pa.
Galion Iron Works & Mfg. Co., Galion, Ohio
Horst & Strieter Co., Davenport, Iowa

FORDSON SAW RIGS
*Amer. Saw Mill Mach'y Co., Hackettstown, N. J.
*Miami Trailer-Scraper Co., Troy, Ohio

FORDSON SCRAPER OUTFITS
*Killefer Mfg. Co., Los Angeles, Calif.
*Miami Trailer-Scraper Co., Troy, Ohio.
Miskin Scraper Works, Ucon, Idaho.
Gustav Schaefer Wagon Co., Cleveland, O.

FORDSON TRACTION TREADS
*Tractor Grip Wheel Co., Toledo, Ohio
Full-Crawler Co., Milwaukee, Wis.
A. C. Johnson Products, Racine, Wis.

FORDSON TRACTOR TRUCKS
Toppins Tractor Truck Co., Appleton, Wis.

FORDSON TRAILER EQUIPMENT
*Miami Trailer-Scraper Co., Troy, Ohio.
Easton Car & Const'n Co., Easton, Pa.
Trail-Ford Corp., Ann Arbor, Mich.
Trailmobile Co., Cincinnati, O.
Troy Trailer & Wagon Co., Troy, O.
Whitehead & Kales Co., Detroit, Mich.

FORDSON TRUCK AND WAGON LOADERS
*George Haiss Mfg. Co., New York
*Spears-Wells Mach'y Co., Oakland, Cal.
Leasman Loader Mfg. Co., Des Moines, Iowa.
N. P. Nelson Iron Works, Brooklyn, N. Y.
Specialty Engineering Co., Philadelphia, Pa.

FORGES
Buffalo Forge Co., Buffalo, N. Y.
Champion Blower & Forge Co., Lancaster, Pa.
Hauck Mfg. Co., Brooklyn, N. Y.

FORGES, OIL
*Mead-Morrison Mfg. Co., East Boston, Mass.

FORM CLAMPS
*Insley Mfg. Co., Indianapolis, Ind.
*Universal Form Clamp Co., Chicago, Ill.
Marion Malleable Iron Works, Marion, Ind.

FORMS, CONCRETE
*Blaw-Knox Co., Pittsburgh, Pa.
*Connery & Co., Philadelphia, Pa.
*Heltzel Steel Form & Iron Co., The, Warren, O.
*Lakewood Engineering Co., Cleveland, O.
*Raber & Lang Mfg. Co., Kendallville, Ind.
*Truscon Steel Co., Youngstown, O.
Concrete Form Co., Inc., Syracuse, N. Y.
Hotchkiss Steel Products Co., Binghamton, N. Y.
Metal Forms Corp., Milwaukee, Wis.

FOREMGRADERS
Edward G. Carr, Chicago, Ill.

FOUNTAINS, DRINKING
Casey-Hedges Co., Chattanooga, Tenn.
Clow & Sons, Jas. B., Chicago, Ill.
Crane Co., Chicago, Ill.
Mott Iron Wks., J. L., New York.
Murdock Mfg. & Supply Co., Cincinnati, Ohio
Puro San. Dr. Ftn. Co., Haydenville, Mass.
Rundle-Spence Mfg. Co., Milwaukee, Wis.
Stewart Iron Works Co., Cincinnati, O.
Taylor Co., Halsey W., Warren, O.
Twentieth Century Brass Wks., Belleville, Ill.

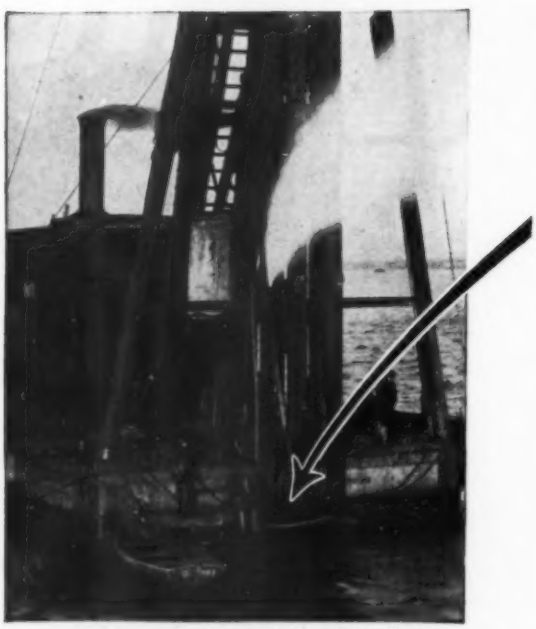
FURNITURE AND FILES, STEEL
Art Metal Constn. Co., Jamestown, N. Y.
General Fireproofing Co., Youngstown, O.
Van Dorn Iron Works Co., Cleveland, O.

GARBAGE CANS. (See Cans)

GARBAGE DISPOSAL
American Beccari Corp., New York.
Balmer Corp., New York.
Bartlett, C. O. & Snow Co., Cleveland, O.
Decarie Incinerator Co., Long Island City, N. Y.
Goder Incinerator Corp., Chicago, Ill.
Hiler Eng. & Const. Co., Brooklyn, N. Y.
Morse-Boulger Destructor Co., New York.
Nye Odorless Crematory Co., Macon, Ga.

GARBAGE TRUCKS AND BODIES
*Heil Co., Milwaukee, Wis.
Convertible Wagon-Trailers, Inc., Buffalo, N. Y.
Holsbog & Bro., Geo. H., Jeffersonville, Ind.
Lee Trailer & Body Co., Chicago, Ill.

McKiernan-Terry Pile Hammers



Pile Hammer Operating 40 Feet Under Water

Driving Piles 40 Feet Under Water

The work illustrated was on the new 4-track high-level railroad bridge across Newark Bay, New Jersey. Seventy-two piers were built in cofferdams which rested on piles driven to within 2 or 3 feet of the bottom of the bay. The piles were driven first, the cofferdams later being set on the pile tops. The bottom of the bay was compact sand and gravel. The piles were 40 to 45 feet long; butts 12 to 14 inches diameter. At low water the pile tops were about 40 feet below the surface. Two McKiernan-Terry 11-B Pile Hammers were used in 85-foot pile driver leads supporting 70-foot telescopic leads in which the hammers operated.

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Wood & Co., R. D., Philadelphia, Pa.

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*Heil Co., Milwaukee, Wis.
*Littleford Bros., Cincinnati, O.
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Birmingham Tank Co., Birmingham, Ala.
Bowser & Co., Inc., S. F., Fort Wayne, Ind.
Chicago Bridge & Iron Works, Chicago, Ill.
Graver Corp., East Chicago, Ind.
Scaife & Sons, Wm. B., Oakmont, Pa.
Tokheim Oil Tank & Pump Co., Ft. Wayne, Ind.
United Iron Works, Inc., Kansas City, Mo.
Wayne Tank & Pump Co., Ft. Wayne, Ind.

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*Ludlow Valve Mfg. Co., Troy, N. Y.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Coffin Valve Co., Boston, Mass.
Coldwell-Wilcox Co., Newburgh, N. Y.
Hardesty Mfg. Co., R., Denver, Colo.

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*Wickwire Spencer Steel Corp., Worcester, Mass.

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Lunkenheimer Co., Cincinnati, O.
Walworth Mfg. Co., Boston, Mass.

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Simplex Valve & Meter Co., Philadelphia, Pa.

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GOVERNORS, GASOLENE ENGINE

*Pickering Governor Co., Portland, Conn.

GRADERS, ROAD (See "Road Graders.")

GRADER BLADES

*Russell Grader Mfg. Co., Minneapolis, Minn.
Adams & Co., J. D., Indianapolis, Ind.
Shunk Mfg. Co., Bucyrus, Ohio

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Leavitt Mfg. Co., Urbana, Ill.
Wayne Iron Wks., Philadelphia, Pa.

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Cleveland Pneumatic Tool Co., Cleveland, Ohio.
Ingersoll-Rand Co., New York.

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(See Drills, Hammer.)

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*Carey Co., Philip, Cincinnati, Ohio.
Johns-Manville, Inc., New York.

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HITCHES

Schaefer Wagon Co., Gustav, Cleveland, Ohio

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*Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
*Harnischfeger Corp., Milwaukee, Wis.
*Lidgerwood Manufacturing Co., New York
*Mead-Morrison Mfg. Co., E. Boston, Mass.
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Amer. Saw Mill Mach'y Co., Hackettstown, N. J.
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Street Bros. Mach. Wks., Chattanooga, Tenn.
Weller Mfg. Co., Chicago, Ill.

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*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Engineering Co., Cleveland, O.
*Mead-Morrison Mfg. Co., E. Boston, Mass.
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*Flory Mfg. Co., S., Bangor, Pa.
*Harnischfeger Corp., Milwaukee, Wis.
*Lidgerwood Manufacturing Co., New York
*Mead-Morrison Mfg. Co., E. Boston, Mass.
American Hoist & Derrick Co., St. Paul, Minn.
Chisholm-Moore Mfg. Co., Cleveland, Ohio.
Mundy Hoisting Eng. Co., J. S., Newark, N. J
National Hoisting Engine Co., Harrison, N. J.
Street Bros. Mach. Wks., Chattanooga, Tenn.
Thomas Elevator Co., Chicago, Ill.
Treadwell Eng. Co., Easton, Pa.

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*American Cement Mchy. Co., Inc., Keokuk, Ia.
*Amer. Saw Mill Mchy. Co., Hackettstown, N. J.
*American Mfg. & Eng. Co., Kalamazoo, Mich.
*Clyde Iron Works Sales Co., Duluth, Minn.
*Construction Machy. Co., Waterloo, Iowa
*Domestic Engine & Pump Co., Shippensburg, Pa.
*Flory Mfg. Co., S., Bangor, Pa.
*Harnischfeger Corp., Milwaukee, Wis.
*Lidgerwood Manufacturing Co., New York
*Mead-Morrison Mfg. Co., E. Boston, Mass.
American Hoist & Derrick Co., St. Paul, Minn.
C. H. & E. Manufacturing Co., Milwaukee, Wis.
Buffalo Hoist & Derrick Co., Buffalo, N. Y.
Lansing Co., Lansing, Mich.
Mundy Hoisting Engine Co., J. S., Newark, N. J.
National Hoisting Engine Co., Harrison, N. J.
Novo Engine Co., Lansing, Mich.
O. K. Clutch & Mach. Co., Columbia, Pa.
Orr & Sembower, Reading, Pa.
Schramm, Inc., West Chester, Pa.
Street Bros. Mach. Wks., Chattanooga, Tenn.
Thomas Elevator Co., Chicago, Ill.

HOISTS, PNEUMATIC

*Curtis Pneumatic Mchy. Co., St. Louis, Mo.
*Dake Engine Co., Grand Haven, Mich.
*Denver Rock Drill Mfg. Co., Denver, Colo.
*Mead-Morrison Mfg. Co., E. Boston, Mass.
*Sullivan Mach'y Co., Chicago, Ill.
Chicago Pneumatic Tool Co., New York.
Detroit Hoist & Machine Co., Detroit, Mich.
Hanna Eng. Works, Chicago, Ill.
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., New York.
Northern Engineering Works, Detroit, Mich.
Worthington Pump & Machy. Corp., New York.

HOISTS, STEAM

*Clyde Iron Works Sales Co., Duluth, Minn.
*Dake Engine Co., Grand Haven, Mich.
*Denver Rock Drill Mfg. Co., Denver, Colo.
*Flory Mfg. Co., S., Bangor, Pa.
*Insley Mfg. Co., Indianapolis, Ind.
*Lidgerwood Manufacturing Co., New York
*Mead-Morrison Mfg. Co., E. Boston, Mass.
American Hoist & Derrick Co., St. Paul, Minn.
Hardie-Tynes Mfg. Co., Birmingham, Ala.
Ingersoll-Rand Co., New York.
Mundy Hoisting Eng. Co., J. S., Newark, N. J.
National Hoisting Engine Co., Harrison, N. J.
Orr & Sembower, Reading, Pa.
Thomas Elevator Co., Chicago, Ill.
Treadwell Eng. Co., Easton, Pa.

HOISTS FOR MOTOR TRUCKS

*Heil Co., The, Milwaukee, Wis.
*Wood Hydr. Hoist & Body Co., Detroit, Mich.
Rock Mfg. Co., Waterloo, N. Y.
Van Dorn Iron Wks., Cleveland, O.

HOLLOW TILE

Bannon Pipe Co., P., Louisville, Ky.
Dee Co., Wm. E., Chicago, Ill.
Dickey Clay Mfg. Co., W. S., Kansas City, Mo.
Medal Paving Brick Co., Cleveland, Ohio.
Metropolitan Paving Brick Co., Canton, Ohio.
National Fireproofing Co., Pittsburgh, Pa.

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*Lakewood Engineering Co., Cleveland, O.
*Littleford Bros., Cincinnati, O.
Ransome Concrete Mchy. Co., Dunellen, N. J.

Dig Cellars the BEAR CAT Way

AT sewer and water main work the Bear Cat Ditcher has a national reputation for speed and low cost, but some people don't know that it is equally successful at digging cellars and basements.

The machine is at no time down in the hole, so the excavation can be cleared with square sides, no runway being left to bring the machine out after completion. This also permits loading trucks on the bank which is a big advantage in itself.

Any size of excavation up to a depth of 18 feet, may be dug by this machine. The ditcher bucket is furnished in several widths, but for cellar digging the 31-inch size is recommended.

The average daily operating cost of the Bear Cat is only $15.23, based upon records of a large number of machines. One man operation and the economical gasoline power plant are big factors in this low cost. Its rugged all steel construction and efficient design give it the ability to stand up under long, hard service with remarkable freedom from repairs.

Byers special caterpillar treads enable the Bear Cat to move quickly and positively on all kinds of ground.

Write, wire or phone for full information.

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Builders also of Truckranes and 10-Ton Full Circle Cranes.
Sales and Service Throughout the Country.

BYERS BEAR CAT CRANE

THE ALL-PURPOSE ONE MAN CRANE

Patents Pending

BYERS BEAR CAT

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Goodyear Tire & Rubber Co., Akron, O.
Ingersoll-Rand Co., New York.
Mulconroy Co., Inc., Phila., Pa.
Penna Flexible Metallic Tubing Co., Phila., Pa.
Republic Rubber Co., Youngstown, O.
U. S. Rubber Co., New York.

HOSE, FIRE
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Eureka Fire Hose Mfg. Co., New York
Fabric Fire Hose Co., New York.
Goodrich Rubber Co., B. F., Akron, O.
Goodyear Tire & Rubber Co., Akron, Ohio.

HOUSE NUMBERS
Hamilton Metal Prod. Co., Hamilton, O.

HOUSES, PORTABLE. (See Buildings, Portable)

HYDRANTS, FIRE
*Ludlow Valve Mfg. Co., Troy, N. Y.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Columbian Iron Works, Chattanooga, Tenn.
Darling Valve & Mfg. Co., Williamsport, Pa.
Eddy Valve & Mfg. Co., Waterford, N. Y.
Iowa Valve Co., Oskaloosa, Ia.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Norwod Engineering Co., Florence, Mass.
Rensselaer Valve Co., Troy, N. Y.
Smith Mfg. Co., A. P., East Orange, N. J.
Wood & Co., R. D., Philadelphia, Pa.

HYDRAULIC RAMS
Deming Co., Salem, O.
Rice Hydraulic Engine Co., New York.
Rumsey Pump Co., Seneca Falls, N. J.
Seattle Machine Works, Seattle, Wash.

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Baker Ice Machine Co., Omaha, Neb.
Brunswick-Kroeschell Co., New Brunswick, N. J.
Carbondale Machine Co., Carbondale, Pa.
De La Vergne Machine Co., New York.
Frick Co., Inc., Waynesboro, Pa.
Triumph Ice Machine Co., Cincinnati, O.
United Iron Works, Inc., Kansas City, Mo.
Vilter Mfg. Co., Milwaukee, Wis.
Vogt Mach. Co., Henry, Louisville, Ky.
York Mfg. Co., York, Pa.

INCINERATORS, GARBAGE. (See Garbage Disposal)

INDICATOR POSTS. (See Valves)

INSPECTING LABORATORIES
*Conard & Busby, Burlington, N. J.
Allentown Testing Laboratories, Allentown, Pa.
Conwell & Co., E. L., Philadelphia, Pa.
Gulick-Henderson Co., New York.
Hunt & Co., Robert W., Chicago, Ill.
N. Y. Testing Laboratories, New York.
Pittsburgh Testing Laboratories, Pittsburgh, Pa.
Standard Testing Laboratories, Inc., New York.

INSTRUMENTS AND SUPPLIES. (Surveyors' and Engineers')
*Warren-Knight Co., Philadelphia, Pa.
Ainsworth & Sons, Wm., Denver, Col.
Beckman Co., L., Toledo, Ohio.
Berger & Sons, C. L., Boston, Mass.
Brandis & Sons Mfg. Co., Brooklyn, N. Y.
Buff & Buff Mfg. Co., Boston, Mass.
Dietzgen Co., Eugene, Chicago, Ill.
Gurley, W. & L. E., Troy, N. Y.
Keuffel & Esser Co., Hoboken, N. J.
Lietz Co., A., San Francisco, Cal.
Leupold & Voelpel, Portland, Ore.
Weber & Co., F., Philadelphia, Pa.
White Co., David, Milwaukee, Wis.
Wissler Instrument Co., St. Louis, Mo.

IRON WORK, STRUCTURAL AND ORNAMENTAL (See Bridges and Buildings)

JACKS, LIFTING
*McKiernan-Terry Drill Co., New York.
Bud Company, Chicago, Ill.
Duff Mfg. Co., Pittsburgh, Pa.
Joyce-Cridland Co., Dayton, O.
Norton, Inc., A. O., Boston, Mass.
Ross Mfg. Co., Pittsburgh, Pa.
Templeton, Kenly & Co., Ltd., Chicago, Ill.
Watson-Stillman Company, New York.

JACKS, PIPE FORCING
Duff Mfg. Co., Pittsburgh, Pa.

JAIL AND PRISON WORK
*Stewart Iron Works Co., Cincinnati, O.
Barnum Iron Works, E. T., Detroit, Mich.
Pauly Jail Bldg. Co., St. Louis, Mo.
Van Dorn Iron Works Co., Cleveland, O.

JOINTS, EXPANSION PAVING (See Expansion Joint Material)

JOINTS, FLEXIBLE PIPE. (See Flexible Joints.)

KETTLES, FOR ASPHALT AND TAR HEATING
*Acme Road Mach. Co., Frankfort, N. Y.
*Aeroil Burner Co., Union Hill, N. J.
*Barber Asphalt Co., Philadelphia, Pa.
*Connery & Co., Inc., Philadelphia, Pa.
*Good Roads Machinery Co., Kennett Square, Pa.
*Kinney Mfg. Co., Boston, Mass.
*Littleford Bros., Cincinnati, O.
*Spears-Wells Mach'y Co., Oakland, Cal.
*Universal Road Machinery Co., Kingston, N. Y.
Birmingham Tank Co., Birmingham, Ala.
Chase & Lyman, Boston, Mass.
Hauck Mfg. Co., Brooklyn, N. Y.
Honhorst Co., Jos., Cincinnati, Ohio.
Macleod Co., Cincinnati, Ohio.
Stuebner Iron Wks., G. L., L. I. City, N. Y.
Tarrant Mfg. Co., Saratoga Springs, N. Y.
Union Iron Wks., Hoboken, N. J.

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Adams & Westlake Co., Chicago, Ill.
Defiance Lantern & Stamping Co., Rochester, N.Y.
Dietz Co., R. E., New York.
Handlan, Buck Mfg. Co., St. Louis, Mo.
Star Headlight & Lantern Co., Rochester, N. Y.

LATH, METAL
*Truscon Steel Co., Youngstown, O.
Berger Mfg. Co., Canton, O.
Bostwick Steel Lath Co., Niles, O.
General Fireproofing Co., Youngstown, O.
Milwaukee Corrugating Co., Milwaukee, Wis.
Northwestern Expanded Metal Co., Chicago, Ill.
Penn. Metal Co., Boston, Mass.
Sykes Metal Lath & Roofing Co., Niles, O.
Youngstown Pressed Steel Co., Warren, O.

LAWN MOWERS
Chadborn & Coldwell Mfg. Co., Newburgh, N. Y.
Coldwell Lawn Mower Co., Newburgh, N. Y.
Gilson Mfg. Co., Port Washington, Wis.
Ideal Power Lawn Mower Co., Lansing, Mich.
Jacobsen Mfg. Co., Racine, Wis.
Penna. Lawn Mower Works, Philadelphia, Pa.
Philadelphia Lawn Mower Co., Philadelphia, Pa.
Townsend Co., S. P., Bloomfield, N. J.
Western Implement Co., Port Washington, Wis.
Worthington Mower Co., Stroudsburg, Pa.

LEADITE
Leadite Co., The, Philadelphia, Pa.

LEAD-MELTING FURNACES
*Aeroil Burner Co., Union Hill, N. J.
*Littleford Bros., Cincinnati, O.
Canton Fdry. & Machy. Co., Canton, O.
Chicago Flexible Shaft Co., Chicago, Ill.
Focht's Sons, Geo., Hoboken, N. J.
Hauck Mfg. Co., Brooklyn, N. Y.
Smith Mfg. Co., A. P., E. Orange, N. J.

LETTERING GUIDES
Wood-Regan Instrument Co., Niagara Falls, N. Y.

LETTERS AND FIGURES, METAL
Niagara Metal Stamp Corp., Niagara Falls, N. Y.

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*Milburn Co., Alex., Baltimore, Md.
Carbic Mfg. Co., Duluth, Minn.
General Electric Co., Schenectady, N. Y.
Hauck Mfg. Co., Brooklyn, N. Y.
Macleod Co., Cincinnati, O.
Prest-O-Lite Co., Inc., New York.

LIGHTING STANDARDS. (See Street Lamp Posts)

LIQUID CHLORINE
Arnold, Hoffman & Co., Inc., New York.
Electro Bleaching Gas Co., New York.
Hooker Electrochemical Co., New York.
Mathieson Alkali Works, Inc., New York.
Penna. Salt Mfg. Co., Philadelphia, Pa.

** Indicates that the manufacturer carries an advertisement. See index facing inside back cover.*

1—Here's how the Barber-Greene vertical boom digs. It's down almost 7 feet here. This ditcher is working for the Birmingham Electric Company.

2—Sailing along on a 17-mile pipe line job between Joliet and Aurora, Illinois. This machine was put on this long job in preference to larger—and cumsier—machines which the Western United Company had on hand.

3—In close quarters. A head on view of a Barber-Greene coming out of a narrow Chicago alley. Here's a tight corner where hand labor has always reigned supreme.

4—A Barber-Greene cutting trench for curb and gutter forms through an outcrop of coral rock in Florida. The speed here is but 3 feet per minute. But the Barber-Greene cut through it

Tear this out and send for the paper "The Use of Small Trenching Machines," delivered by A. G. Ford of the Western United Gas & Electric Co., before the 21st convention of the Illinois Gas Assn.

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Address.....

City.....

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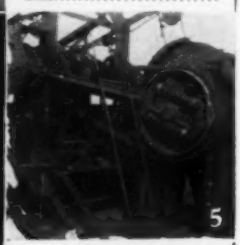

5—This overload release sprocket guards the Barber-Greene from the shocks of encountering hidden obstructions. It releases and locks automatically. When the load on the buckets is removed the sprocket automatically starts them digging again.

Here's Why They're Buying Barber-Greenes

The East Bay Water Company, Oakland, California, dug fourteen miles of 18" by 3½' ditch at a cost of 4.79 cents per lineal foot with their Barber-Greene. This figure includes all possible digging items—interest on the investment, depreciation, upkeep, operation, incidental labor and cost of moving the machine from job to job.

Most of the digging was short run stuff. That makes the low cost per lineal foot still more remarkable. And it makes it easier to see why more and more companies are buying Barber-Greenes.

A Barber-Greene is fast on its feet. This handiness goes farther than dodging in and out of tight corners. It is translated into real digging speed.

A Barber-Greene walked through 5,000 lineal feet of trench during its second day on a Texas pipe line job. That's another reason why they're buying Barber-Greenes. And there are still more.

The vertical boom digs straight down. The Barber-Greene seldom loses more than its own length in digging up to an obstruction. And the vertical boom digs service laterals flush with the main ditch.

The full length crawlers turn the Barber-Greene in its own length and permit it to trench across rough or soft ground. An overload release sprocket protects the ditcher's mechanism from the shocks of encountering hidden obstructions. It makes the Barber-Greene as careful as human hands in digging around buried pipe.

That's why they're buying Barber-Greenes. The Barber-Greene is a fast, hard-hitting, comparatively small machine. It's easy to handle. It's easy to hold to line and grade. It digs a clean ditch. And it's fast on its feet.

Yes, it's easy to see why they're buying Barber-Greenes. Filling out the coupon in the upper right hand corner will give you a more complete story. It will bring you A. G. Ford's paper, "The Use of the Small Trenching Machine," and the latest Barber-Greene collection of ditching job pictures and information.

BARBER-GREENE COMPANY—*Representatives in Fifty Cities*—482 West Park Ave., Aurora, Ill

BARBER GREENE

Portable Belt Conveyors — Self Feeding Bucket Loaders

Coal Loaders . . . Automatic Ditch Diggers . . . Coal Feeders

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*Barber-Greene Co., Aurora, Ill.
*Bay City Dredge Works, Bay City, Mich.
*Haiss Mfg. Co., Geo., New York.
*Industrial Plants Corp., Toledo, O.
*Russell Grader Mfg. Co., Minneapolis, Minn.
*Sauerman Bros., Chicago, Ill.
*Smith Co., T. L., Milwaukee, Wis.
*Spears-Wells Mach'y Co., Oakland, Cal.
*Universal Road Machinery Co., Kingston, N. Y.
Austin Machinery Corp'n, Muskegon, Mich.
Bonney Supply Co., Inc., Rochester, N. Y.
Chain Belt Co., Milwaukee, Wis.
Conant Machine Co., Concord Junction, Mass.
Fairfield Enginering Co., Marion, Ohio
Gifford-Wood Co., Hudson, N. Y.
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Jeffrey Mfg. Co., Columbus, O.
Lee Trailer & Body Co., Chicago, Ill.
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Nelson Iron Wks., Brooklyn, N. Y.
Portable Machy. Co, Passaic, N. J.
Sackett Screen & Chute Co., H. B., Chicago, Ill.
Specialty Eng. Co., Philadelphia, Pa.
Weller Mfg. Co., Chicago, Ill.

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East Jersey Pipe Co., New York.

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Medart Mfg. Co., Fred., St. Louis, Mo.

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*Whitcomb Co., Geo. D., Rochelle, Ill.
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American Locomotive Co., New York.
Baldwin Locomotive Works, The, Phila., Pa.
Brookville Track & Tractor Co., Brookville, Pa.
Davenport Locomotive Works, Davenport, Ia.
Fate-Root-Heath Co., Plymouth, O.
Lima Locomotive Wks., Lima, O.
Industrial Equipment Co., Inc., Minster, O.
Milwaukee Locomotive Mfg. Co., Milwaukee, Wis.
Plymouth Locomotive Works, Plymouth, O.
Porter Co., H. K., Pittsburgh, Pa.
Westinghouse Elec. & Mfg. Co., E. Pittsb'gh, Pa.

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Brown Co., Portland, Me.
Crowell & Spencer Lumber Co., Long Leaf, La.
Exchange Sawmills Sales Co., Kansas City, Mo.
Great Southern Lumber Co., Bogalusa, La.
Industrial Lumber Co., Elizabeth, La.
Long Bell Lumber Co., Kansas City, Mo.
Sargent Lumber Co., Little Rock, Ark.
Sterner Co., Inc., E. J., New York.
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LUMBER, STEEL
*Truscon Steel Co., Detroit, Mich.
Berger Mfg. Co., Canton, O.
General Fireproofing Co., Youngstown, O.

MANHOLE COVERS. (See "Castings, Street")

METAL LATH. (See "Lath")

METAL ROOFING (See "Roofing")

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Clark Co., H. W., Mattoon, Ill.
Clow & Sons, J. B., Chicago, Ill.
Columbian Iron Works, Chattanooga, Tenn.
Mueller Company, Decatur, Ill.

METER COUPLINGS
*Ford Meter Box Co., Wabash, Ind.
*Neptune Meter Co., New York.
*Pittsburgh Meter Co., Pittsburgh, Pa.
*Union Water Meter Co., Worcester, Mass.
Clark Co., H. W., Mattoon, Ill.
Mueller Company, Decatur, Ill.

METER TESTERS
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*Neptune Meter Co., New York.
*Pittsburgh Meter Co., Pittsburgh, Pa.
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General Electric Co., Schenectady, N. Y.
Sangamo Electric Co., Springfield, Ill.
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*Pittsburgh Meter Co., Pittsburgh, Pa.
American Meter Co., New York.
Bailey Meter Co., Cleveland, O.
Builders Iron Fdry., Providence, R. I.
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*Badger Meter Mfg. Co., Milwaukee, Wis.
*Neptune Meter Co., New York.
*Pittsburgh Meter Co., Pittsburgh, Pa.
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Gamon Meter Co., Newark, N. J.
Hersey Mfg. Co., Boston, Mass.
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Worthington Pump & Mchy. Corp., New York.

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Builders Iron Foundry, Providence, R. I.
Simplex Valve & Meter Co., Philadelphia, Pa.

MIXERS, CONCRETE (See Concrete Mixers)

MIXERS, GROUT
*American Cement Mchy. Co., Inc., Keokuk, Ia.
*Lakewood Engineering Co., Cleveland, O.
Kent Machine Co., Kent, O.
Union Iron Works, Inc., Hoboken, N. J.

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*Koehring Co., Milwaukee, Wis.
Austin Machinery Corp'n, Muskegon, Mich.

MIXERS, MORTAR
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*Blaw-Knox Co., Pittsburgh, Pa.
*Construction Machinery Co., Waterloo, Ia.
*Lakewood Engineering Co., Cleveland, O.
*Smith Co., T. L., Milwaukee, Wis.
Austin Machinery Corp'n, Muskegon, Mich.
C. H. & E. Manufacturing Co., Milwaukee, Wi
Kent Machine Co., Kent, O.
Knickerbocker Co., Jackson, Mich.
Lansing Co., Lansing, Mich.
Marsh-Capron Co., Chicago, Ill.
Ransome Concrete Mchy. Co., Dunellen, N. J.

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Excelsior Motor Mfg. & Supply Co., Chicago, Ill.
Harley-Davidson Motor Co., Milwaukee, Wis.
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MOTORS, GASOLINE
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*Continental Motors Corp., Detroit, Mich.
*Hinckley Motors, Inc., Detroit, Mich.
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Buda Co., Harvey, Ill.
Le Roi Co., Milwaukee, Wis.
Waukesha Motor Co., Waukesha, Wis.
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*United Motor Products Co., Grand Rapids, Mich.
Acme Motor Truck Co., Cadillac, Mich.
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Autocar Co., Ardmore, Pa.
Bessemer Motor Truck Co., Grove City, Pa.
Brockway Motor Truck Co., Cortland, N. Y.
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Diamond T. Motor Car Co., Chicago, Ill.

** Indicates that th manufacturer carrie- en advertisement. See index facing inside back cover.*

NEWPORT CULVERTS

Made of genuine Gohi Sheet Metal (Genuine Open Hearth Iron) successfully meet the most exacting

Rust Resisting

specifications of Architects and Engineers because they are made of pure iron-copper alloy. Exposed to the elements or corrosive agents they are practically immune because of their

Enduring Quality

The above is a photographic reproduction of an 18-in. Newport Culvert installed in the Autumn of 1912 under the roadway of the S. C. & C. Ry. This culvert is still in splendid condition.

Newport Culverts made up in various sizes, round or half round, in lengths up to 20 feet, will meet the requirements of any installation. They will neither crack, become disjointed, nor disintegrate.

Write for valuable information sent free.

The NEWPORT CULVERT CO.

533 W. 10th Street **NEWPORT, KENTUCKY**

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Gramm & Kincaid Motors, Inc., Lima, Ohio
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Indiana Truck Corp'n., Marion, Ind.
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Hoar Shovel Co., Duluth, Minn.

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*Barrett Co., New York.
*Standard Oil Co., (Indiana), Chicago, Ill.
*Texas Company, New York.
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Headley Good Roads Co., Philadelphia, Pa.
Pioneer Asphalt Co., Lawrenceville, Ill.
Standard Oil Co., (La.) New Orleans, La.
Standard Oil Co., (N. J.), Newark, N. J.
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*Barrett Co., New York.
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*Dixon Crucible Co., Jos., Jersey City, N. J.
*Solvay Process Co., New York
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*Carey Co., Philip, Cincinnati, Ohio.
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Hydrex Asphalt Products Corp., New York
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Art Concrete Works, Pasadena, Calif.
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Mott Iron Wks., J. L., New York.

PAVING AND ROAD ROLLERS. (See Road and Paving Rollers)

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Alton Brick Co., Alton, Ill.
Binghamton Brick Co., Binghamton, N. Y.
Buckeye Shale Brick Co., Cleveland, Ohio
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Burton Townsend Co., Zanesville, N. Y.
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Southern Clay Mfg. Co., Chattanooga, Tenn.
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Sterling Brick Co., Olean, N. Y.
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Terre Haute Vit. Brick Co., Terre Haute, Ind.
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Veedersburg Pa er Co., Veedersburg, Ind.
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PAVING MATERIALS. (See "Asphalt," "Paving Brick," "Granite Block," etc.)

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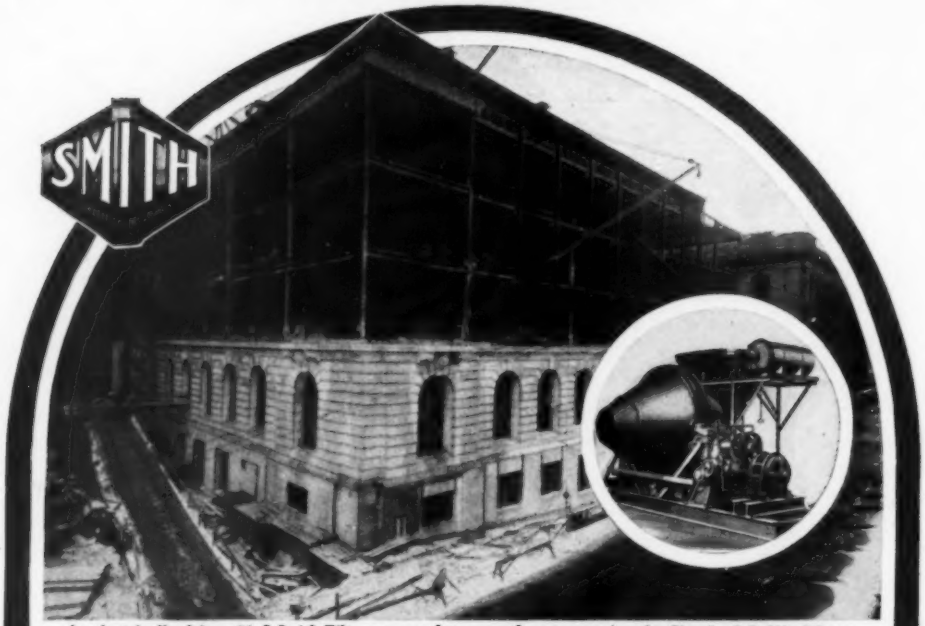
*Warren Bros. Co., Boston, Mass.
Anderson Tool & Sup. Co., W. H., Detroit, Mich
Cummer & Sons Co., F. D., Cleveland, O.
Union Iron Works, Hoboken, N. J.



An electrically driven 21-S Smith Tilter was used to pour the concrete for the Cleveland Public Library This mixer was a veteran of over twelve years of hard service and it is still going strong today

A Record Hard to Equal

Once again the superiority of Smith Tilter design and construction is demonstrated by the performance of The 21-S Smith Tilter used in the construction of the Cleveland Public Library. This mixer was a 1912 model and although it had beeen in continuous use for over a decade, the contractors, Lundoff Bicknell Company, state that it turned out concrete on the library job just as well as on the first day it was put in use.

Time and again experience in the field has shown that "Smiths" are dependable producers —that they serve throughout a long life of heavy duty at a minimum of maintenance and operating cost. This 21-S Tilter was operated with original steam engine and boiler until it was put on the library job when it was changed to electric motor drive — the only important replacement in 12 years.

During its years of service it was used on such jobs as: "The Kinney Levan Bldg., in 1912, the Standard Sanitary Mfg. Co. Bldg., in 1913, The Telling Bell Vernon Plant in 1914, The Weideman Co. Bldg., in 1915, The Cadillac Bldg., and the building for the Standard Parts Co. in 1916, The American Brake Shoe Plant in Erie, Pa., in 1917, the Cleveland Automobile Fact'y, in 1918 and '19, The Ward Baking Co. Plant, 1922-23.

Let us send you our new Mixer and Paver Catalog No. 500 which fully describes and illustrates our complete line of Tilting and Non-Tilting Mixers.

***The* T. L. SMITH COMPANY**
1030 - 32nd St., Milwaukee, Wisconsin

Sales Offices and Service Stations in all Principal Cities

Smith Tilting Mixers are built in the following sizes: 2½, 3½, 5, 7, 10, 14, 21, 28, 40, 56 and 112 cu. ft. per batch; Smith Non-Tilting Mixers: 7, 14, 21, 28 cu. ft. per batch; Smith Paving Mixers: 21-E.

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Browning Co., Cleveland, O.
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*National Cast Iron Pipe Co., Birmingham, Ala.
*U. S. Cast Iron Pipe & Fdy. Co., Burlington, N. J.
American Cast Iron Pipe Co., Birmingham, Ala.
Clow & Sons, J. B., Chicago, Ill.
Donaldson Iron Co., Emans, Pa.
Fox & Co., John, New York.
Glamorgan Pipe & Fdry. Co., Lynchburg, Va.
Lynchburg Foundry Co., Lynchburg, Va.
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Lock Joint Pipe Co., E. Orange, N. J.
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Newark Concrete Pipe Co., Newark, N. J.

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*Connery & Co., Inc., Philadelphia, Pa.
*Littleford Bros., Cincinnati, Ohio.
Abendroth & Root Mfg. Co., Newburgh, N. Y.
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Canton Culvert & Silo Co., Canton, O.
Chatta. Boiler & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago, Ill.
East Jersey Pipe Co., New York.
Hammond Iron Works, Warren, Pa.
Hardesty Mfg. Co., R., Denver, Colo.
Honhorst Co., Jos., Cincinnati, Ohio.
Lancaster Iron Works, Lancaster, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Tippet & Wood, Phillipsburg, N. J.
Welter Mfg. Co., Chicago, Ill.

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East Jersey Pipe Co., New York.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
National Tube Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.
Spang-Chalfont & Co., Pittsburgh, Pa.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

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Continental Pipe Mfg. Co., Seattle, Wash.
Michigan Pipe Co., Bay City, Mich.
Pacific Tank & Pipe Co., San Francisco, Cal.
Redwood Mfrs. Co., San Francisco, Cal.
Standard Wood Pipe Co., Williamsport, Pa.
Wyckoff & Sons Co., A., Elmira, N. Y.

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Reading Iron Co., Reading, Pa.

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Walworth Mfg. Co., Boston, Mass.

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Norristown Mag. & Asb. Co., Norristown, Pa.
Sall Mt. Co., Chicago, Ill.
Watson Co., H. F., Erie, Pa.

85 PER CENT MAGNESIA
*Carey Co., Philip, Cincinnati, Ohio.
Ehret Magnesia Co., Valley Forge, Pa.
Johns-Manville, Inc., New York.
Keasbey & Mattison Co., Ambler, Pa.

WOOD
Continental Pipe Mfg. Co., Seattle, Wash.
Redwood Mfrs. Co., San Francisco, Cal.
Ric-Wil Co., Cleveland, O.
Wyckoff & Son Co., A., Elmira, N. Y.

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PIPE FITTINGS
*Central Foundry Co., New York.
*Nat'l Cast Iron Pipe Co., Birmingham, Ala.
*U. S. Cast Iron Pipe & Fdry. Co., Burlington, N. J.
American C. I. Pipe Co., Birmingham, Ala.
Builders Iron Fdry., Providence, R. I.
Clow & Sons, J. B., Chicago, Ill.
Crane Co., Chicago, Ill.
Lunkenheimer Co., Cincinnati, O.
Reading Steel Casting Co., Inc., Bridgeport, Conn
Warren Fdry. & Mach. Co., New York.
Wood & Co., R. D., Philadelphia, Pa.

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Taylor Portable Steel Derrick Co., Chicago, Ill.

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*Carey Co., Philip, Cincinnati, Ohio.
*Pacific Flush Tank Co., Chicago and New York
G. K. Sales Co., Macungie, Pa.
Leadite Company, Inc., Philadelphia, Pa.
Ruberoid Co., New York.
Waring-Underwood Co., Philadelphia, Pa.

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Leadite Co., The, Philadelphia, Pa.
United Lead Co., New York.

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American Playground Device Co., Anderson, Ind.
Chicago Gymnasium Equip. Co., Chicago, Ill.
Everwear Mfg. Co., Springfield, O.
George, Howard, Philadelphia, Pa.
Hill-Standard Co., Anderson, Ind.
Medart Mfg. Co., Fred., St. Louis, Mo.
Mitchell Mfg. Co., Milwaukee, Wis.
Patterson-Williams Co., San Jose, Calif.
Spalding & Bros., A. G., Chicopee, Mass.
Zieg Mfg. Co., F. B., Fredericktown, Ohio

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*Austin-Western Rd. Mach. Co., Chicago, Ill.
*Burch Plow Works Co., Crestline, O.
*Russell Grader Mfg. Co., Minneapolis, Minn.
Adams & Co., J. D., Indianapolis, Ind.

WONDER MIXERS
WONDER Trailer
WONDER "3½"
WONDER "5"
WONDER "14" with Track Loader
WONDER "7" with Track Loader
The 1925 Models Offer
—Improved design throughout
—Increased power plants
—Lower prices
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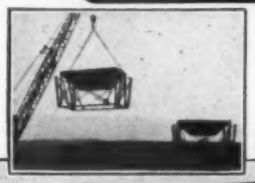

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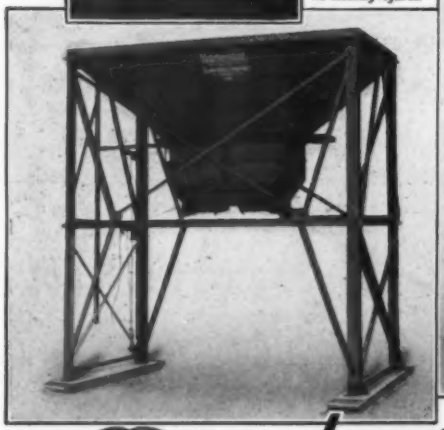

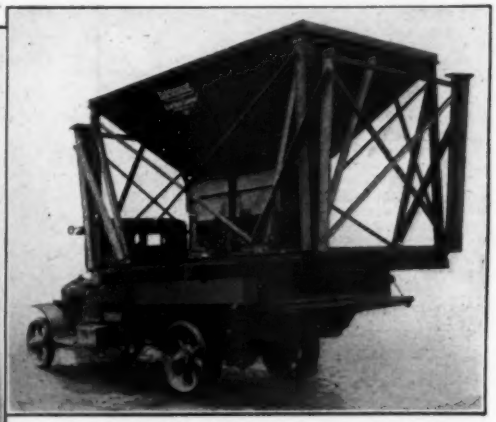

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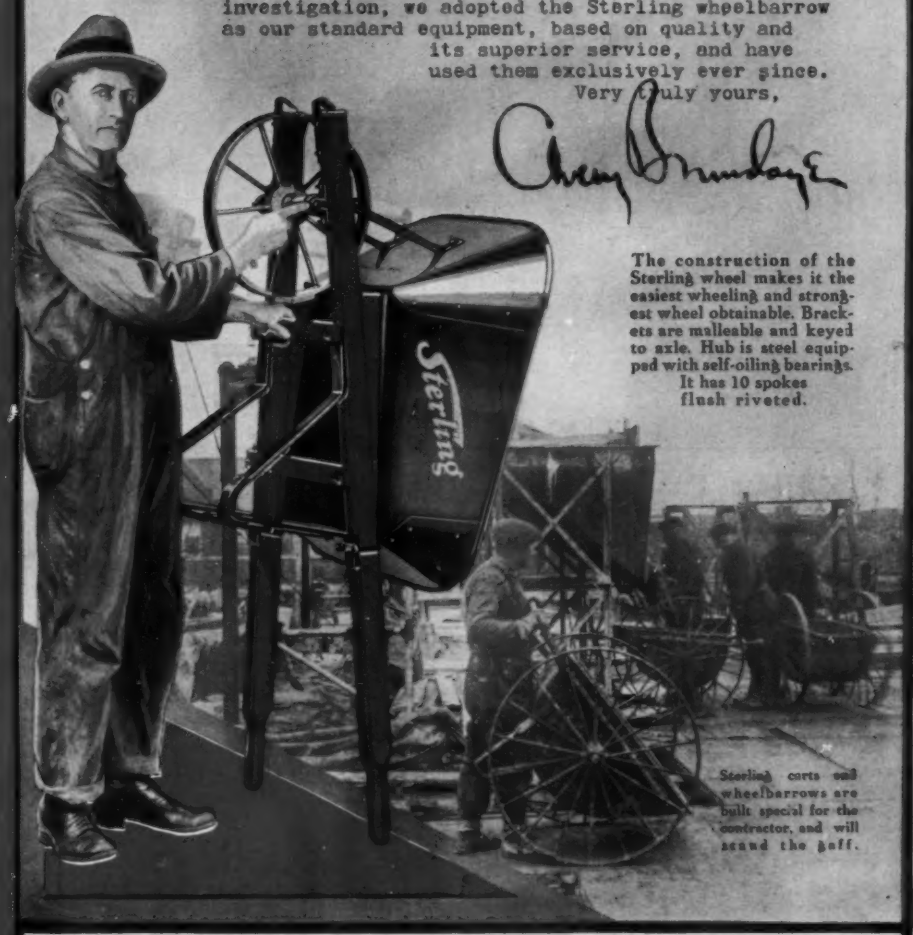

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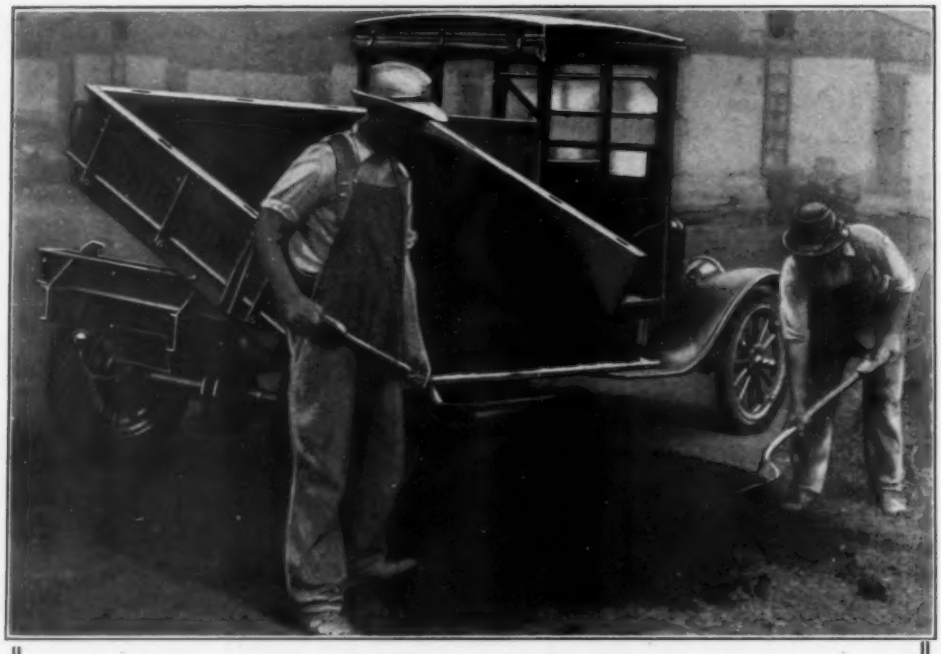

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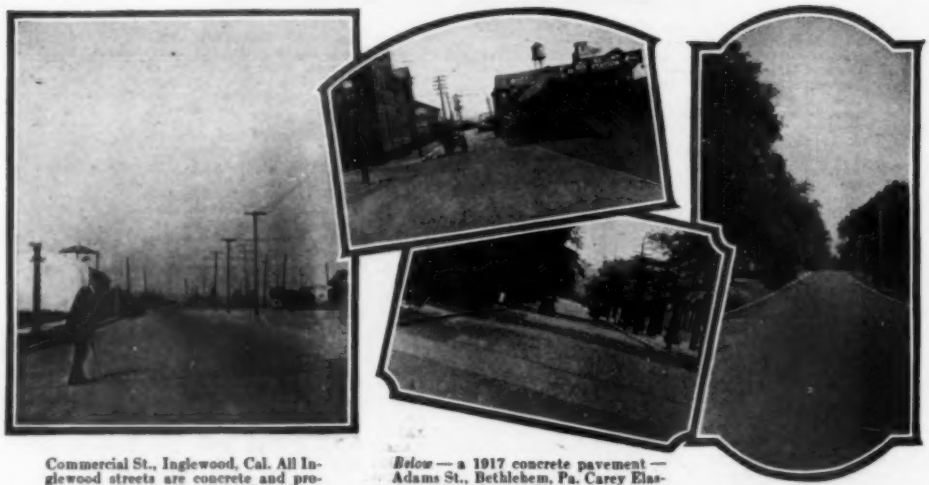

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*Russell Grader Mfg. Co., Minneapolis, Minn.
Shunk Mfg. Co., Bucyrus, Ohio

SCOOPS
*Oliver Ames & Sons Corp., North Easton, Mass.
*Ames Shovel & Tool Co., Boston, Mass.
*Geo. Griffiths Co., Cheltenham, Pa.
*The H. M. Myers Co., Beaver Falls, Pa.
*T. Rowland's Sons, Inc., Cheltenham, Pa.
*St. Louis Shovel Co. Plant, St. Louis, Mo.
*Wright Shovel Co., Anderson, Ind.

SCRAPERS, DRAGLINE
*Russell Grader Mfg. Co., Minneapolis, Minn.
*Sauerman Bros., Chicago, Ill.

SCRAPERS, POWER DRAG
*Russell Grader Mfg. Co., Minneapolis, Minn.
*Sauerman Bros., Chicago, Ill.
Green, L. P., Chicago, Ill.

SCRAPERS, ROAD (See Road Scrapers)

SCRAPERS, SELF-LOADING
*Baker Mfg. Co., Springfield, Ill.
*Russell Grader Mfg. Co., Minneapolis, Minn.
*Shaw-Enochs Tractor Co., Minneapolis, Minn.

SCREENS, SAND, GRAVEL AND COAL
*Atlas Eng. Co., Milwaukee, Wis.
*Austin-Western Road Mchy. Co., Chicago, Ill.
*Good Roads Mach'y Co., Kennett Square, Pa.
*Haiss Mfg. Co., New York.
*Littleford Bros., Cincinnati, O.
*Russell Grader Mfg. Co., Minneapolis, Minn.
*Universal Road Machinery Co., Kingston, N. Y.
*Wickwire Spencer Steel Corp., New York.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Austin Mfg. Co., Chicago, Ill.
C. O. Bartlett & Snow Co., Cleveland, Ohio.
Case Threshing Machine Co., J. I., Racine, Wis.
Chain Belt Co., Milwaukee, Wis.
Galion Iron Wks. & Mfg. Co., Galion, Ohio.
Gifford-Wood Co., Hudson, N. Y.
Green, L. P., Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago, Ill.
Lyle Culv. & Rd. Equip. Co., Minneapolis, Minn
Newaygo Eng. Co., Newaygo, Mich.
New Jersey Wire Cloth Co., Trenton, N. J.
Robins Conv. Belt Co., New York.
Sackett Screen & Chute Co., H. B., Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

SCREENS, SEWAGE
Green Bay Fdry. & Mach Wks., Green Bay, Wis.
Link-Belt Co., Philadelphia, Pa.
Sanitation Corp'n, New York.
Simplex Ejector Co., Chicago, Ill.

SEWAGE DISPOSAL APPARATUS
*Pacific Flush Tank Co., Chicago and New York.
Dorr Co., New York.
Sanitation Corp'n, New York.
Simplex Ejector Co., Chicago, Ill.

SEWAGE PUMPS (See "Pumps, Sewage")

SEWAGE EJECTORS
*Pacific Flush Tank Co., Chicago and New York.
Sanitation Corp'n, New York.
Simplex Ejector Co., Chicago, Ill.
Yeomans Bros. Co., Chicago, Ill.

SEWER BLOCKS, SEGMENT
American Vit. Products Co., Akron, O.
Cannelton Sewer Pipe Co., Cannelton, Ind.
Denver Sewer Pipe & Clay Co., Denver, Col.
Evens & Howard Fire Brick Co., St. Louis, Mo.
Dickey Clay Mfg. Co., W. S., Kansas City, Mo.
Laclede Christy Clay Products Co., St. Louis, Mo.
Macomb Sewer Pipe Wks., Macomb, Ill.
Pacific Clay Products Co., Los Angeles, Cal.
Red Wing Sewer Pipe Co., Red Wing, Minn.
Robinson Clay Products Co., Akron, O.
Standard Fire Brick & Sewer Pipe Co., Pueblo, Col.

SEWER CLEANING APPARATUS
Champion Corporation, Hammond, Ind.
Self Propelling Nozzle Co., New York.
Turbine Sewer Machine Co., Milwaukee, Wis.

SEWER PIPE AND DRAIN TILE
American Vit. Products Co., Akron, O.
Blackner & Post Pipe Co., St. Louis, Mo.
Dee Co., Wm. E., Chicago, Ill.
Delaware Clay Products Co., Pittsburgh, Pa.
Dickey Clay Mfg. Co., W. S., Kansas City, Mo.
Denver Sewer Pipe & Clay Co., Denver, Col.
National Fireproofing Co., Pittsburgh, Pa.
Ohio Vitrified Pipe Co., Uhrichsville, O.
Robinson Clay Products Co., Akron, O.

SEWER PIPE FORMS
Raber & Lang Mfg. Co., Kendallville, Ind.
Quinn Wire & Iron Works, Boone, Iowa

SEWER RODS
Bissell Co., F., Toledo, O.
Champion Corporation, Hammond, Ind.
Healy, P. J., Jersey City, N. J.
Luck Sewer Equip. Co., Chicago, Ill.
Turbine Sewer Machine Co., Milwaukee Wis.

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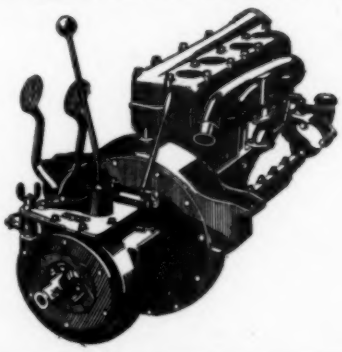

SHINGLES, METAL
Berger Mfg. Co., Canton, Ohio.
Canton Art Metal Co., Canton, Ohio.
Edwards Mfg. Co., Cincinnati, Ohio.
Eller Mfg. Co., Canton, Ohio.
Milwaukee Corrugating Co., Milwaukee, Wis.
Nat'l Sheet Metal Roofing Co., Jersey City, N. J.
Newport Rolling Mill Co., Newport, Ky.
Penn Metal Co., Boston, Mass.
Klauer Mfg. Co., Dubuque, Ia.
Tiffin Art Metal Co., Tiffin, Ohio
Wheeling Metal Mfg. Co., Wheeling, W. Va.

SHORES
*Universal Form Clamp Co., Chicago, Ill.
The O. D. G. Co., Owensboro, Ky.
Roos Co., H. W., Cincinnati, O.
Roos-Meyer-Hecht Co., Cincinnati, O.
Symons Clamp & Mfg. Co., Chicago, Ill.

SHOVELS, ELECTRIC
*Bay City Dredge Works, Bay City, Mich.
*Byers Machine Co., Ravenna, O.
*Koehring Co., Milwaukee, Wis.
*Osgood Co., Marion, Ohio
*Thew Shovel Co., Lorain, O.
Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.

SHOVELS, GASOLINE
*Bay City Dredge Works, Bay City, Mich.
*Byers Machine Co., Ravenna, O.
*Harnischfeger Corp., Milwaukee, Wis.
*Koehring Co., Milwaukee, Wis.
*Osgood Co., Marion, Ohio
*Thew Shovel Co., Lorain, O.
American Steel Dredge Co., Fort Wayne, Ind.
Austin Machinery Corp'n, Muskegon, Mich.
Buyerus Co., So. Milwaukee, Wis.
Fairbanks Steam Shovel Co., Marion, O.
Marion Steam Shovel Co., Marion, O.
Orton & Steinbrenner Co., Chicago, Ill.

SHOVELS, HAND
*Oliver Ames & Sons Corp., North Easton, Mass.
*Ames Shovel & Tool Co., Boston, Mass.
*Geo. Griffiths Co., Cheltenham, Pa.
*The H. M. Myers Co., Beaver Falls, Pa.
*T. Rowland's Sons, Inc., Cheltenham, Pa.
*St. Louis Shovel Co. Plant, St. Louis, Mo.
*Wright Shovel Co., Anderson, Ind.
Beall Bros. Co., Alton, Ill.
Conneaut Shovel Co., Conneaut, O.
Hubbard & Co., Pittsburgh, Pa.
Indiana Shovel Co., New Castle, Ind.
Jackson Shovel Co., Montpelier, Ind.
Pittsburgh Shovel Co., Pittsburgh, Pa.
Russell Shovel Co., Aliquippa, Pa.
Stevens-Webb Co., Inc., Altoona, Pa.
Union Furnace Mfg. Co., Altoona, Pa.
Wood Shovel & Tool Co., Piqua, Ohio.
Wyoming Shovel Works, Wyoming, Pa.

SHOVELS, STEAM
*Byers Machine Co., Ravenna, Ohio
*Keystone Driller Co., Beaver Falls, Pa.
*Osgood Co., The, Marion, O.
*Thew Shovel Co., Lorain, O.
Austin Machinery Corp'n, Muskegon, Mich.
Bellwood Steam Shovel Co., Bellwood, Pa.
Browning Co., Cleveland, O.
Bucyrus Co., South Milwaukee, Wis.
Erie Steam Shovel Co., Erie, Pa.
Fairbanks Steam Shovel Co., Marion, O.
Industrial Works, Bay City, Mich.
Marion Steam Shovel Co., Marion, O.
Orton & Steinbrenner Co., Chicago, Ill.

SIGNS, STREET AND ROAD
Auto Sign Display Co. of Mo., St. Louis, Mo.
Automatic Signal & Sign Co., Chicago, Ill.
Baltimore Enamel & Novelty Co., Baltimore, Md.
Cavanagh Bros. & Co., New York.
Elkhart Fdry. & Mach. Co., Elkhart, Ind.
Evernu-Century Sign Co., Boston, Mass.
Ingram-Richardson Mfg. Co., Beaver Falls, Pa.
Lyle-Signs, Minneapolis, Minn.
Municipal Street Sign Co., New York.
Nelke Sign Co., J. L., New York.
Union Iron Products Co., East Chicago, Ind.
Western Display & Mfg. Co., St. Paul, Minn.

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Acme Traffic Signal Co., Los Angeles, Cal.
Adams & Westlake, Chicago, Ill.
Auto Sign Display Co. of Mo., St. Louis, Mo.
Automatic Signal & Sign Co., Chicago, Ill.
Automatic Signal & Sign Co., Canton, O.
American Gas Accumulator Co., Elizabeth, N. J.
Crouse-Hinds Co., Syracuse, N. Y.
Elkhart Fdry. & Mach. Co., Elkhart, Ind.
Esseo Mfg. Co., Peoria, Ill.
Evernu-Century Sign Co., Boston, Mass.
Griswold Safety Signal Co., Minneapolis, Minn.
Horni Signal Mfg. Corp., Newark, N. J.
Klug & Smith Co., Milwaukee, Wis.
Line Material Co., So. Milwaukee, Wis.
Little Giant Co., Mankato, Minn.
Lyle-Signs, Minneapolis, Minn.
Ohio Traffic Devices Co., Columbus, O.
Tokheim Oil Tank & Pump Co., Fort Wayne, Ind.
Traffic Sign & Signal Co., Gloucester, Mass.
Traffic Signal Corp., New York.
Union Iron Products Co., E. Chicago, Ind.

SLATE, ROOFING
Vendor Slate Co., Inc., Easton, Pa.

SLATE, STRUCTURAL
Keenan Structural Slate Co., Bangor, Pa.
Penna. Structural Slate Co., Easton, Pa.
Phoenix Slate Co., Windgap, Pa.
Structural Slate Co., Pen Argyl, Pa.

SLEEVES, TAPPING AND VALVE
Mueller Company, Decatur, Ill.
Rensselaer Valve Co., Troy, N. Y.
Smith Mfg. Co., A. P., East Orange, N. J.

SLUICE GATES. (See Gates, Sluice)

SMOKE STACKS. (See Stacks, Steel)

SNOW CLEANING MACHINERY
*Austin-Western Road Machy. Co., Chicago, Ill.
*Baker Mfg. Co., Springfield, Ill.
*Barber-Greene Co., Aurora, Ill.
*Good Roads Mach. Co., Kennett Square, Pa.
*Mack Trucks, Inc., New York.
*Mead-Morrison Mfg. Co., East Boston, Mass.
*Monarch Tractors, Inc., Watertown, Wis.
*Shaw-Enochs Tractor Co., Minneapolis, Minn.
Caterpillar Tractor Co., Peoria, Ill.
Cleveland Tractor Co., Cleveland, Ohio.
Toy Co., W. M., Sidney, Ohio.
Union Iron Wks., Inc., Bangor, Me.
Owensboro Ditcher & Grader Co., Owensboro, Ky.

SPADES (See Shovels)

SPRAYERS, ASPHALT AND TAR
*Kinney Mfg. Co., Boston, Mass.

SPRAYING MACHINERY FOR TREES
Bean Spray Pump Co., Lansing, Mich.
Deming Co., The, Salem, Ohio.
Field Force Pump Co., Elmira, N. Y.
Fitzhenry-Guptill Co., East Cambridge, Mass.

SPREADERS, STONE
*Austin-Western Road Mchy. Co., Chicago, Ill.
*Burch Plow Works Co., Crestline, O.
*Shaw-Enochs Tractor Co., Minneapolis, Minn.

STACKS, STEEL
*Blaw-Knox Co., Pittsburgh, Pa.
*Connery & Co., Inc., Philadelphia, Pa.
*Heil Co., The, Milwaukee, Wis.
*Littleford Bros., Cincinnati, O.
Birmingham Tank Co., Birmingham, Ala.
Chatta. Boiler & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago, Ill.
Honhorst Co., Jos., Cincinnati, O.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Scaife & Sons Co., Wm. B., Pittsburgh, Pa.
Walsh & Weidner Boiler Co., Chattanooga, Tenn.

STANDPIPES, TANKS AND TOWERS
*Connery & Co., Inc., Philadelphia, Pa.
Caldwell Co., W. E., Louisville, Ky.
Chattanooga Blr. & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago, Ill.
Lancaster Iron Wks., Lancaster, Pa.
Pacific Tank & Pipe Co., San Francisco, Cal.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
United Iron Works, Inc., Kansas City, Mo.
Walsh & Weidner Boiler Co., Chattanooga, Tenn.

STEAM SHOVELS. (See Shovels, Steam)

STEAM TURBINES. (See Turbines.)

STEEL PLATE CONSTRUCTION
*Blaw-Knox Co., Pittsburgh, Pa.
*Connery & Co., Philadelphia, Pa.
*Heil Co., The, Milwaukee, Wis.
*Heltzel Steel Form & Iron Co., Warren, O.
*Littleford Bros., Cincinnati, O.
Bethlehem Steel Co., Bethlehem, Pa.
Biggs Boiler Wks., Akron, O.
Birmingham Tank Co., Birmingham, Ala.
Chatta. Boiler & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago, Ill.
Graver Corporation, E. Chicago, Ind.
Hendrick Mfg. Co., Carbondale, Pa.
Honhorst Co., Jos., Cincinnati, Ohio.

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Riter-Conley Co., Pittsburgh, Pa.
Scaife & Sons, Wm. B., Pittsburgh, Pa.
Toledo Crane Co., Toledo, O.
Union Iron Works, Hoboken, N. J.
Walsh & Weidner Boiler Co., Chattanooga, Tenn.

STOKERS, MECHANICAL
Automatic Furnace Co., Dayton, Ohio.
Babcock & Wilcox Co., New York.
Combustion Engine Corp., New York.
Detroit Stoker Co., Detroit, Mich.
Sanford Riley Stoker Co., Worcester, Mass.
Westinghouse Elec. & Mfg. Co., E. Pittsb'gh, Pa.

STREET AND ROAD SIGNS. (See Signs, Street and Road.)

STREET CLEANERS' CARTS
Durlach Can & Iron Works, Brooklyn, N. Y.
Rochester Can Co., Rochester, N. Y.
Tarrant Mfg. Co., Saratoga Springs, N. Y.

STREET FLUSHERS AND SPRINKLERS
*Austin-Western Road Machy. Co., Chicago, Ill.
*General Motors Truck Co., Pontiac, Mich.
*Heil Co., The, Milwaukee, Wis.
*Kinney Mfg. Co., Boston, Mass.
*Mack Trucks, Inc., New York.
Autocar Co., Ardmore, Pa.
Etnyre & Co., E. D., Oregon, Ill.
Hvass & Co., Chas., New York.
Federal Motor Truck Co., Detroit, Mich.
Municipal Supply Co., South Bend, Ind.
Pierce-Arrow Motor Car Co., Buffalo, N. Y.
White Co., Cleveland, O.

STREET LAMP POSTS
American Concrete Prod. Co., Chicago, Ill.
Chicago Concrete Post Co., Chicago, Ill.
Clow & Sons, J. B., Chicago, Ill.
Drake Mfg. Co., Friendship, N. Y.
Electric Railway Equipment Co., Cincinnati, O.
King Mfg. Co., Chicago, Ill.
Mott Iron Wks., J. L., New York.
Union Metal Mfg. Co., Canton, O.
Westinghouse Elec. & Mfg. Co., E. Pittsb'gh, Pa.

STREET SIGNS (See Signs, Street)

STREET SWEEPERS
*Austin-Western Road Mchy. Co., Chicago, Ill.
*Good Roads Mach. Co., Kennett Square, Pa.
*Kinney Mfg. Co., Boston, Mass.
*Universal Road Machinery Co., Kingston, N. Y.
Butler Mfg. Co., Cleveland, O.
Elgin Sales Corp'n, New York.
Foamite-Childs Corp., Utica, N. Y.

STREET SWEEPING BROOMS
*Littleford Bros., Cincinnati, O.
Holcomb Mfg. Co., J. I., Indianapolis, Ind.
Ind. Brush & Broom Mfg. Co., Indianapolis, Ind.
Kendallville Broom & Brush Co., Kendallville, Ind.
Lang Broom Co., Pittsburgh, Pa.
Lay Co., Jos., Ridgeville, Ind.
Milwaukee Brush Mfg. Co., Milwaukee, Wis.
Osborn Mfg. Co., Cleveland, Ohio.

STREET SWEEPING BROOMS REFILLED
Kendallville Broom & Brush Co., Kendallville, Ind.
Lang Broom Co., Pittsburgh, Pa.
Osborn Mfg. Co., Cleveland, Ohio.

STRUCTURAL STEEL AND IRON. (See Bridges

STUMP PULLERS
*Clyde Iron Wks. Sales Co., Duluth, Minn.
*La Plant-Choate Mfg. Co., Cedar Rapids, Ia.
Bennett & Co., H. L., Westerville, O.
Thomas Elevator Co., Chicago, Ill.

SUBGRADING MACHINES
*The Hug Co., Highland, Ill.
*Lakewood Engineering Co., Cleveland, Ohio
*Shaw-Enochs Tractor Co., Minneapolis, Minn.

SUPERHEATERS
Babcock & Wilcox Co., New York.
Power Specialty Co., New York.
Superheater Co., New York.

SURVEYORS' INSTRUMENTS. (See Instruments.)

SWITCHBOARDS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Wagner Elec. Mfg. Co., St. Louis, Mo.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

TABLES AND BOARDS, DRAWING. (See Drawing Materials.)

TAMPING MACHINES
*Harnischfeger Corp., Milwaukee, Wis.
Ingersoll-Rand Co., New York.

TANKS, AIR COMPRESSOR
*Connery & Co., Inc., Philadelphia, Pa.
*Curtis Pneumatic Mchy. Co., St. Louis, Mo.
*Heil Co., Milwaukee, Wis.
*Littleford Bros., Cincinnati, O.
Abendroth & Root Mfg. Co., New York.
Biggs Boiler Wks., Akron, O.
Birmingham Tank Co., Birmingham, Ala.
Chicago Bridge & Iron Works, Chicago, Ill.
Chicago Pneumatic Tool Co., New York.
Graver Corporation, E. Chicago, Ind.
Indiana Air Pump Co., Indianapolis, Ind.
Ingersoll-Rand Co., New York.
Lancaster Iron Wks., Lancaster, Pa.
National Tube Co., Pittsburgh, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Scaife & Sons Co., W. B., Pittsburgh, Pa.
Westinghouse Tract. Brake Co., Wilmerding, Pa.
Worthington Pump & Machy. Corp., New York.

TANKS, STEEL
*Connery & Co., Philadelphia, Pa.
*Heil Co., Milwaukee, Wis.
*Littleford Bros., Cincinnati, O.
Biggs Boiler Wks., Akron, O.
Birmingham Tank Co., Birmingham, Ala.
Bowser & Co., Inc., S. F., Fort Wayne, Ind.
Case Threshing Mach. Co., J. I., Racine, Wis.
Caldwell Co., W. E., Louisville, Ky.
Chatta. Boiler & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago, Ill.
Columbian Steel Tank Co., Kansas City, Mo.
Dover Boiler Wks., New York.
Farrell Mfg. Co., Joliet, Ill.
Fouts Co., C. C., Middletown, O.
Graver Corporation, E. Chicago, Ind.
Hardesty Mfg. Co., R., Denver, Col.
Hendrick Mfg. Co., Carbondale, Pa.
Honhorst Co., Jos., Cincinnati, Ohio.
Lancaster Iron Works, Lancaster, Pa.
Pacific Tank & Pipe Co., San Francisco, Cal.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Riter-Conley Co., Pittsburgh, Pa.
Scaife & Sons, Wm. B., Oakmont, Pa.
United Iron Works, Inc., Kansas City, Mo.
Walsh & Weidner Boiler Co., Chattanooga, Tenn.
Wayne Tank & Pump Co., Ft. Wayne, Ind.

TANKS, WOOD
Caldwell Co., W. E., Louisville, Ky.
Davis & Son, G. M., Palatka, Fla.
Eagle Tank Co., Chicago, Ill.
Hauser-Stander Tank Co., Cincinnati, O.
Kalamazoo Tank & Silo Co., Kalamazoo, Mich.
National Tank & Pipe Co., Portland, Ore.
Pacific Tank & Pipe Co., San Francisco, Cal.
Redwood Manufacturers Co., San Francisco, Calif.
Stearns Lumber Co., A. T., Boston, Mass.
U. S. Wind Engine & Pump Co., Batavia, Ill.
Wendnagel & Co., Chicago, Ill.

TANK WAGONS
*Acme Road Mach. Co., Frankfort, N. Y.
*Heil Co., Milwaukee, Wis.
*Mack Trucks, Inc., New York.
Birmingham Tank Co., Birmingham, Ala.
Butler Mfg. Co., Minneapolis, Minn.
Case Threshing Mach. Co., J. I., Racine, Wis.

TAPES, STEEL AND METALLIC
*Lufkin Rule Co., Saginaw, Mich.
Dietzgen Co., Eugene, New York.
Keuffel & Esser Co., Hoboken, N. J.
Starrett, L. S., Athol, Mass.

TAPPING MACHINES
Hays Mfg. Co., Erie, Pa.
Mueller Co., Decatur, Ill.
Smith Mfg. Co., A. P., E. Orange, N. J.

TAR
*Barrett Co., New York.
American Tar Products Co., Chicago, Ill.

TAR KETTLES. (See Kettles)

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*Ascroll Burner Co., Union Hill, N. J.
Hauck Mfg. Co., Brooklyn, N. Y.

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Keystone Driller Co., Beaver Falls, Pa.
Link-Belt Co., Chicago, Ill.
Locomotive Crane Co., of America, Champaign, Ill.
McMyler Interstate Co., Cleveland, Ohio
Northwest Engineering Co., Chicago, Ill.
Orton & Steinbrenner, Chicago, Ill.
Osgood Co., Marion, Ohio

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National Hoisting Engine Co., Harrison, N. J.
O. K. Clutch & Machinery Co., Columbia, Pa.
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Davenport Locomotive Works, Davenport, Iowa
Fate-Rooth-Heath Co., Plymouth, Ohio
Mid-West Locomotive Works, Cincinnati, Ohio
Vulcan Iron Works, Wilkes-Barre, Pa.
Geo. D. Whitcomb Co., Rochelle, Ill.

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The Russell Co., Massillon, Ohio
J. T. Tractor Co., Cleveland, Ohio
Wisconsin Farm Tractor Co., Sauk City, Wis.

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Harry Pennington, Houston, Texas
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—**when you need Air Compressor Units:**
Mundie Manufacturing Co., Peru, Ill.
Rix Compressed Air & Drill Co., San Francisco, Cal.

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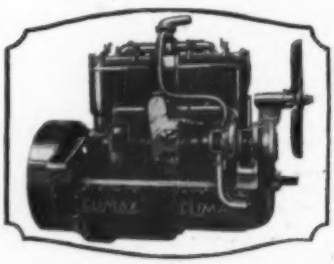

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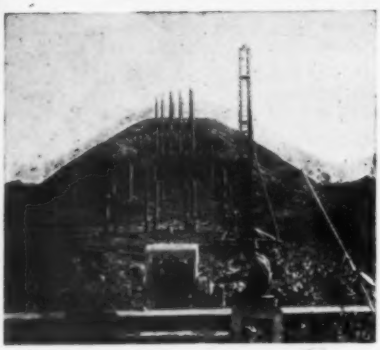

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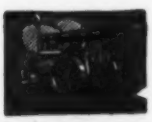

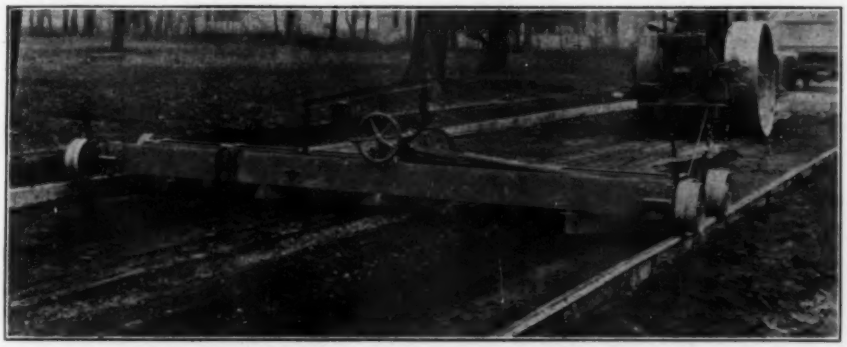

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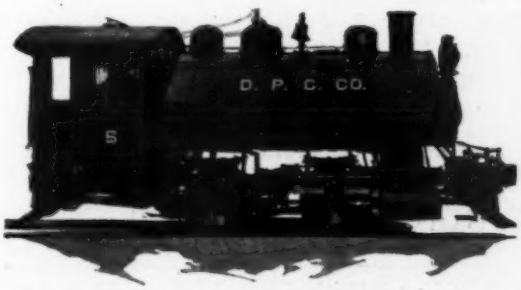

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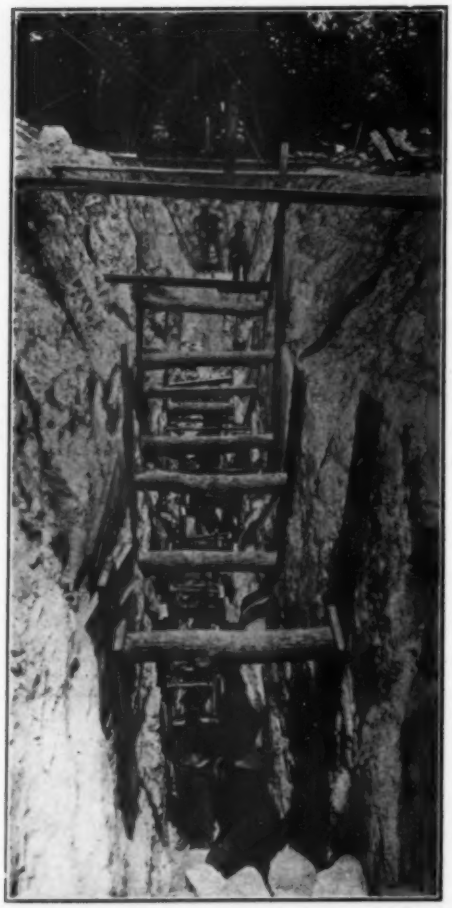
Sewer Construction at Pleasantville, N. Y.

By J. C. Harding, Jr.
Fuller & McClintock, Consulting Engineers, New York City

THE village of Pleasantville, N. Y., is a residential community located on the Harlem Division of the New York Central Railroad 30 miles north of New York City. The population is about 4,000. The probable cost of the sewers now under construction is in the neighborhood of $200,000. The principal quantities entering into the work are 34,000 feet of 8- to 15-inch sewers; 150 manholes; 10,000 feet of 5-inch house connections; 125 tons of cast iron pipe, and about 8,000 cubic yards of rock excavation.

Pleasantville is situated on the slopes of the Sawmill River Valley, and the surface is hilly. Many of the streets are too narrow to allow traffic to continue in the roads during construction, and it was necessary, therefore, to block all

ROCK DRILLING ON SEWER TRENCH IN PLEASANTVILLE, N. Y. Keystone excavator in background, ready to remove material when broken up



EXCEPTIONAL SEWER TRENCH EXCAVATION THROUGH SOLID ROCK TO A DEPTH OF 26 FEET

For a distance of 200 feet on the Pleasantville sewer job all rock was picked out by three concrete breakers without blasting. The narrow trench with straight side walls materially cut down the yardage of rock to be excavated. The contractor was Joseph Nolle, East Orange, N. J.

traffic during that period. Practically all buildings are supplied with gas and water services, increasing the difficulty of machine excavation. The material excavated, other than rock, was a mixture of sand and clay with a thin layer of surface loam. In the majority of the streets sewered, rock was close to the surface of the ground, which accounts for the unusual amount of rock removed, about 35 per cent of all excavation.

The rock formation met with is interesting. In the lower sections of the village the formation is for the most part limestone, while in the upper sections Manhattan schist is found. In some places these formations have been folded over one another and many are found with the stratifications on edge. Both of these formations contain intrusions of granite. While some of the rock met with was sound, hard rock, quite a percentage was disintegrated.

Probably on account of this nearness of ledge rock to the surface, ground water was generally encountered in the trenches, even in the higher parts of the village. Some running sand and quick mud was encountered, necessitating tight sheathing.

The average depth of trench over the entire system is about 7.5 feet. The contractor used three steam-operated Keystone trench excavators on the work. These machines were particularly adapted for the conditions met with at Pleasantville, not only because of their ability to stand up under the severe digging conditions, but also because they were handled easily in working around obstructions such as water- and gas-mains, storm drains, service pipes, etc. They were also more efficient in handling the disintegrated and the broken rock than would have been the case with many other types of trenching machinery. During a period of about five months, while three machines were engaged on the work, the delays caused by making repairs to them totaled only three days, although there were times when the excavators were not busy because of other causes. The greater part of this three-day delay was occasioned by changing cables.

For refilling the trenches, two Wonder scraper type backfillers were used. These machines required four men each to operate them—three on the scraper, and one operator. They were therefore more expensive under some conditions than machines that require the attention of an operator only. In this instance, however, where the streets were narrow and blocked to a considerable extent by excavated material, the scraper type of machine could be used most advantageously, and the crew, when not working with the backfiller, were available for extra help on other parts of the work.

For rock excavation, three modern automobile type Ingersoll-Rand air-compressors were used, having a capacity of 90, 160 and 250 cubic feet of air per minute, respectively. The drills used were Ingersoll-Rand type CC-25.

As labor for this class of work is scarce in Westchester County because of extensive building and highway construction, the contractor found it advantageous to bring in his entire force from outside. A bunk-house was built beyond the village limits, and no charge was made to the men for its use. Common labor was paid at the rate of 65 to 75 cents per hour. Many of the laborers and all of the machine operators and foremen have been continuously employed by this contractor for at least five years.

With the excavating and backfilling machinery, there were 45 men employed. One excavating machine with a crew of from 8 to 10 men worked on the sections in the village where work was necessarily slow because of traffic conditions. Another machine with 10 men worked on sections where rock and water conditions were not serious enough to interfere materially with the rapid progress of the work. The third excavating machine had a crew of 18 men and was used on the more difficult parts of the work, particularly where large amounts of rock were encountered. The machine was used to strip the loose material down to rock and to remove the broken stone and the decomposed rock. The men were divided into two gangs, each gang having an air-compressor.

The 8 men necessary to operate the two backfilling machines were shifted around to help any force which needed assistance, as backfilling operations required only a small percentage of their entire time.

Where hard rock was encountered, it was blasted and removed, as is usually done on trench work. Where decomposed or soft rock was encountered, however, Ingersoll-Rand paving breakers were used, which chipped out the rock more quickly and at a less cost than could be done by blasting.

The advantage of the use of these paving breakers in excavating soft limestone rock was particularly well illustrated in a 200-foot strip of sewer trench which had to be excavated to a depth of about 26 feet. This was too short and of not sufficient depth to make tunneling attractive. Removing the rock by blasting would have been expensive, as it would have required a wide ditch in order to remove the rock satisfactorily from such a depth, whereas the contractor was being paid for a trench but 2 feet 8 inches wide. At this place the rock strata lay nearly vertical, and the paving breakers broke this off in large pieces quite easily and it was necessary to excavate the trench only to a width of 3 feet. The broken-up rock was removed to a depth of about 14 feet by the Keystone excavator, and below that depth it was piled over the pipe already laid after a sufficient covering of earth had first been placed over the pipe. This method of handling rock was found to be much less expensive than the ordinary method of drilling and blasting.

Sheathing was driven rapidly and economically with paving breakers by means of a special channel-shaped clamp fitting over the ends of the sheathing.

The progress of the work as indicated by the approximate value of work done monthly is as follows:

Estimate No.		
1.	April, 1924	$23,360
2.	May, 1924	34,232
3.	June, 1924	27,424
4.	July, 1924	46,290
5.	August, 1924	28,472
6.	September, 1924	12,059
7.	October, 1924	3,811
8.	November, 1924	5,638
9.	December, 1924	1,125
	Total	$182,411

In September two of the excavators were removed, leaving only one to complete the work.

Joseph Miele, of East Orange, N. J., was the general contractor, and Phillip Gasparinni, of Mount Vernon, N. Y., was subcontractor for a section of the work. J. Oliver Derby, of Pleasantville, N. Y., was engineer in charge of construction.

ACKNOWLEDGMENT.—Photographs by courtesy of Ingersoll-Rand.

How Many Brick per Hour per Man?

A SATISFACTORY comparison of the efficiency of labor cannot be made unless there are records of actual time worked and actual results accomplished on jobs that present identical conditions. Any contractor knows that his organization seldom handles identical jobs one after another. Besides this obstacle to keeping an accurate check on labor efficiency, the cost records required by contractors seldom record data relative to the units of production per hour per man.

In fact, the United States Commissioner of Labor Statistics claims that his organization was unable to find a single building contractor, superintendent, or foreman who had a record of work done per man-hour on the jobs in progress or on any former job. In the bricklaying trade the Bureau of Labor Statistics of the United States Department of Labor undertook to investigate identical jobs in 15 cities. Straight wall work on 8-, 9-, 12-, and 17-inch walls of a comparable volume were selected. All other conditions were selected for their similarity as far as it was possible.

In Atlanta the average number of brick laid per 8-hour day was found to be 1482.4 on the 23 jobs investigated. On 10 similar jobs in Indianapolis the average number of brick laid per day was 765.6, and in Minneapolis and St. Paul, 1545.6 brick were laid per man per day on 21 jobs. In other words, it was found that in the two cities in which open-shop bricklayers did a percentage of the work, the average efficiency of both organized and unorganized labor was double that found in at least one city in which union labor has control. The reports from other places seem to bear out this generalization.

Strange to relate, the difference in efficiency found on jobs in the same city was no greater than the difference in the average productivity of all the jobs in some different cities. While in localities in which work is done extensively on the open-shop basis, investigation disclosed greater efficiency among bricklayers, the men on non-union jobs in such localities did not show any noticeable superiority over those on the organized operations. Perhaps the open-shop mechanics set the pace and the union men on other jobs worked just as fast, or a little faster, if possible.

In the strictly closed-shop towns are found the lowest output and the highest costs for brick work. A lack of variation in performance also exists, which might indicate artificial control of work done. At any rate, it appears from the evidence gathered through this unbiased source that the open shop tends to heighten the productivity of bricklayers.

—*The American Contractor.*

Investigation of Earth Roads

THE Highway Research Board of the National Research Council, according to Charles M. Upham, Director, has designated Professor S. S. Steinberg, of the University of Maryland, as Acting Secretary in charge of the new investigation which the Board is instituting on the development of earth roads. The object of this investigation, which will be national in scope, is to coordinate the efforts and data already available on the improvement of earth roads and to stimulate further research in order to find an inexpensive surface that will carry intermediate traffic at a low cost of construction and maintenance.

GENERAL VIEW OF HILLIARD ROAD BRIDGE, SHOWING THREE SPANS AND CABLEWAY TOWERS.

Construction Features of the Hilliard Road Bridge

Mechanical Handling of Material Speeds Work

THE Hilliard Road Bridge at Cleveland is now approaching completion. This bridge is being built to relieve the congestion of vehicular travel on the other bridges spanning Rocky River. The bridge is of concrete, with rib pier and spandrel arches. The total length of the bridge and approaches is 900 feet. There are three large spans, the center one being 280 feet, and the ones at each side 200 feet each. The piers are 90 feet high. The width of the road-bed is 56 feet.

In preparing the foundation for the piers, 10,000 cubic yards of earth were excavated, to reach a good shale foundation. This was excavated by clam-shell buckets, worked on steel derricks operated by Lidgerwood three-drum engines, with separate reverse valve swinging engines. One engine is now being used for pile driving, the derrick handling the guides with steam hammer.

The Walsh Construction Company, Davenport, Iowa, has the contract for the construction of this bridge; F. W. Smith, General Manager and General Superintendent; C. E. Boales, Field Superintendent, and J. M. Dohm, Engineer. Excellent progress has been made because of the careful planning of the entire work. The matter of transportation of the material after it reached the bridge site was one of importance, and it was excellently planned.

All material is received at the Nickel Plate Railroad. Conveyors are used to load trucks at the depot. William Smith has a subcontract for this work. He employs six 5-ton trucks on the work. All material is delivered at the (west) end of the bridge, about one mile from the depot.

Kept on hand in storage pile continually fed by trucks, are 10,000 yards of sand and 10,000 yards of crushed stone. The stiff-leg derrick, with clam-shell bucket, operated by a Lidgerwood hoist, takes material from these piles and delivers to the bins, which hold 300 yards of sand and 600 yards of rock. The tops of these bins are flush with the base of the storage piles. On the same level is the storage house for cement. The bags of cement are opened and the cement poured through a chute, which connects with chutes below and leading from the sand and rock bins, and the proper mixture thus runs from them into the two mixers, one a Lakewood, and the other a Milwaukee-Lakewood, each of ¾-yard capacity.

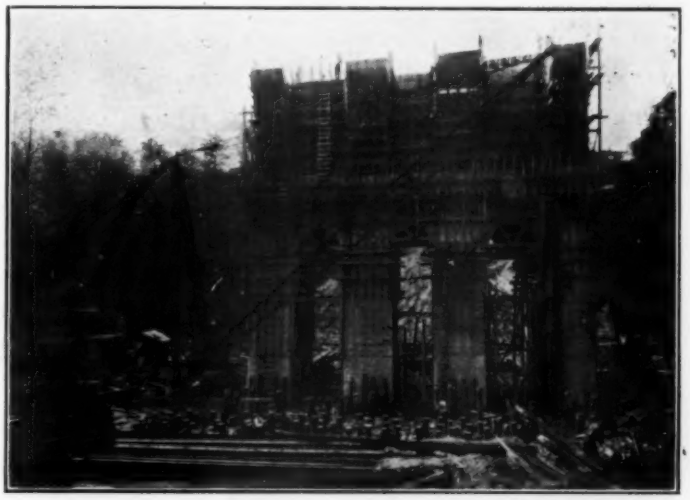
From the mixers the concrete is run directly into a 2½-yard bottom-dump tub standing on a narrow-gage car. Tub and car are then run along a track about 100 feet long under the line of the cableway. The car is pulled back and forth by an endless rope, operated by a small Lidgerwood

HAULING SAND AND STONE FOR THE HILLIARD BRIDGE JOB

Jeffrey portable belt conveyors were used for handling the sand and stone by W. B. Smith, cartage contractor, Cleveland, Ohio

hoist. The cableway picks up the tub, carries it, and dumps it at any point along the line of the bridge.

The head tower of the cableway is set far enough back from the edge of the gorge so that trucks carrying material can unload directly under the line of the cableway. The cableway handled not only the concrete, but also the arch steel centering, the 12 x 12-inch and 8 x 16-inch timbers used for supports of steel centering, cut rock railing, cast iron drain pipes, tie-rods, etc. The cableway also picked up and reset derricks and hoisting engines, set the steel arch centering, and placed all reinforcing and form lumber.



STIFF-LEGGED DERRICK WITH PILE DRIVER PREPARING FOUNDATION FOR PIER

The head tower of the cableway, with the operating hoists, is mounted on a car, and travels along a trackway about 85 feet long. The travel of the cableway is performed by an endless rope, operated by a Lidgerwood spool hoist; the rope runs from the drum over a sheave on a deadman anchorage at each end of the track. This cableway has a span of 1,100 feet between towers, with a maximum load of 10 tons, and an average load of 6 tons. It is therefore capable of taking a load and placing it at any point along the length or width of the bridge.

The close coordination of these ways of getting material from the railroad, not only to the site of the bridge, but to the particular place on the bridge where they become part of it, has resulted in speed in the construction, and low cost of handling. This type of cableway, known as the radial, has every advantage of a long span, traveling, overhead crane. The head tower traveling on its tracks not only enables it to pick up material at any point within its travel (the distance of travel can be as great as required), but also enables the cableway to carry the material out, lower it, and place it at any desired point along the line of the bridge. Forms and steel members are placed by the cableway, and concrete poured directly. There is no rehandling. The Day & Maddock Company, local representatives of the Lidgerwood Manufacturing Company in Cleveland, have kept in close touch with the entire work, facilitating it in many ways.

The value of the cableway in bridge construction, and particularly in such locations as the Rocky River bridge, spanning a deep gorge, is self-evident. There is no other method that will place and move about the auxiliary machines, nor lay in place the construction material itself, as cheaply and economically.

The amount of concrete that has been laid up to date is 14,000 yards, and there remains about 11,000 yards to be poured. The present state of construction of the bridge is 60 per cent complete, and it is expected to be completed and opened for traffic about January 1, 1926.

On this work another important thing has been well taken care of, that is, the comfort of the construction gang. They are housed in two large, comfortable bunk-houses, 16 feet by 60 feet, with shower-baths and individual lockers. There are nine cottages for married employees. The mess hall accommodates 150 men. The cottages are all fitted with electric lights and piped with city water.

The following engineers were connected with the design of this bridge: A. M. Felgate, Bridge Engineer; W. H. Baker, Field Engineer; and F. R. Lander, County Surveyor.

Robinson Now with Ginsberg-Penn

THE Ginsberg-Penn Company, Inc., 18 East 41st Street, New York City, distributors of construction equipment, have announced that E. Gwynn Robinson, formerly of the R. E. Brooks Company, of New York City, has become a member of their firm. Mr. Robinson will continue to render the special service to contractors with regard to plant layout and design which he has heretofore given so successfully in the New York district.

New Reservoir and Water Tunnel for Calumet City, Ill.

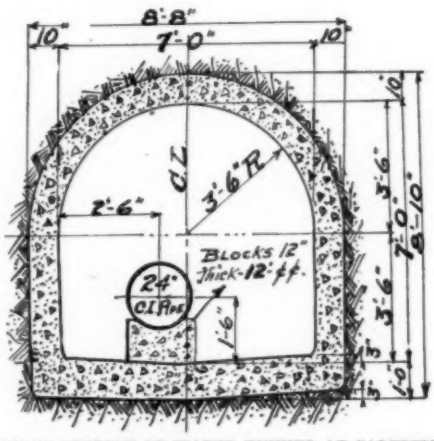
By Ernest A. Clark
President, Subway Engineering Company, Chicago, Ill.

CALUMET CITY, ILL., formerly West Hammond, is the latest suburb to seek the convenience of Chicago's water-supply for its own needs, and has signed a contract calling for two million gallons of water per day, on a basis of 62½ cents per 1,000 cubic feet, from the Chicago Water Department. This city completes a list of 33 suburbs scattered around the edge of Chicago which are now being supplied with 17,500,000 gallons of the 868,000,000 gallons of lake water pumped daily by the city of Chicago. The water will be supplied between 1 A.M. and 5 A.M., when the Chicago demand is at its low point, and will be stored in a 2,000,000-gallon reinforced concrete reservoir and pumped from there into the city mains as required.

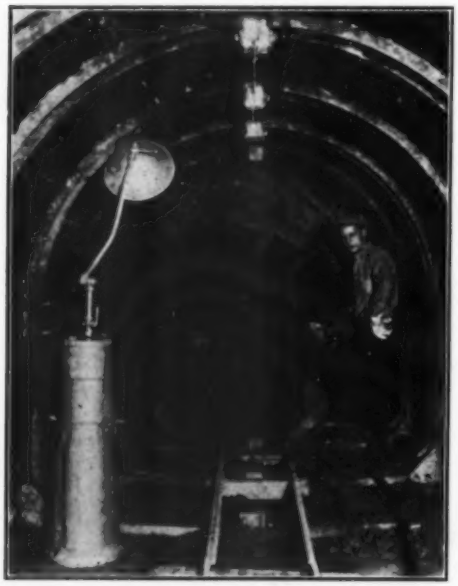
The water will be pumped from Chicago through a 24-inch cast iron main laid through and supplying the districts of Colehour, Ford City, Hegewisch, and Burnham, and passing under the Grand Calumet River in a 7 x 7-foot concrete-lined siphon tunnel into Calumet City.

Reservoir

The reservoir is a large circular reinforced concrete tank, 180 feet inside diameter, and 13 feet high, with a capacity of 2,000,000 gallons. The floor and roof are 8½ inches thick, and the circular wall 15 inches thick. Ninety-seven columns 20 inches in diameter support the roof and fill. The 6 feet of excavation required for the reservoir was handled with teams and Western slip scrapers and was stored on the bank around the tank to be used for back-fill. The concrete for the reservoir was a 1:1¾:3 mix; 1½-inch washed gravel and washed torpedo sand were used for the coarse and fine aggregate. Five pounds of hydrated lime was added to the mix for each bag of cement, and all concrete was mixed in a 21-S Ransome steam-driven, side-loading concrete mixer.



CROSS-SECTION OF WATER TUNNEL AT CALUMET CITY



MINING WITH PNEUMATIC SHOVELS IN PIPE TUNNEL
This illustration also shows the steel channel ribs and lagging for concrete forms

The reinforced concrete floor slab rests on a sand foundation. It is 184½ feet in diameter and was poured in four sections with joints made of 18-inch wide by No. 17 zinc plate. A footing was placed under the wall measuring 3½ feet by 1 foot, and under all joints a footing 2 feet by 9 inches was placed. A sump, measuring 7 x 8 feet and 5 feet deep, was provided for the outlet pipe, and a reinforced concrete box 7 x 8 feet and 5 feet high, resting on the floor, was constructed for the inlet pipe. Both inlet and outlet pipes were 24-inch cast iron pipe, provided with elbows on the inside of the wall of the reservoir. The inlet elbow turned up and the outlet down. An 8-inch cast iron pipe was laid from the bottom of the sump to the sewer in the adjacent street.

The material for the concrete was stored on a plank platform placed on the bank on top of the excavation, and the mixer was also placed on the bank about 13 feet above the floor level. The concrete for the floor was spouted from the mixer to a 1-yard hopper and wheeled from there on temporary runways. The surface of the floor

PLACING REINFORCING STEEL IN FLOOR AND FOR COLUMNS OF THE COVERED CONCRETE RESERVOIR

was given a float finish and then covered with sand and kept wet for ten days.

The concrete for the circular wall was poured in two sections with a zinc plate vertical joint and one connecting the floor and side walls. The forms were made of wood with 2 x 6-inch uprights spaced 18 inches apart and 1-inch boards. Circular segments were cut for the uprights to rest npon and to form the circle of the wall. Universal spreader ties were used for wall spacers and ties for holding the forms. After the forms were removed, the spreader holes were filled with 1:2 mortar, and both the inside and the outside surfaces of the wall were brushed with a 1:2 paint-like mortar to fill all the small air-holes, and the wall was kept wet ten days.

The columns and roof slab were poured from the top with carts run on a temporary runway resting on the roof form supports. Johnson steel forms were used for the columns. For loading the carts, the concrete was elevated with a 24 x 28-foot portable gas-driven belt conveyor, which raised the concrete to a 1-yard hopper resting on the roof form support. The roof was poured in four sections with zinc plate joints. The forms for the roof rested on 4 x 4-inch supports with 4 x 6-inch girders and 2 x 6-inch stringers and 1-inch floor boards. Four concrete vents were placed in the roof, each 30 inches inside diameter with 4-inch walls, 5 feet high. These were for ventilation and were covered with fine-mesh bronze screen and capped with a steel hood 5 feet in diameter. A 4 x 6-foot manhole frame and cover was placed in the roof over the inlet pipe.

After the concrete in the roof had set, it was covered with 30 inches of sand and 6 inches of black dirt. Side slopes of the fill around the reservoir were 1 to 2. Before any backfilling was done, the reservoir was filled with four feet of water to test for leaks in the joints between the floor and the wall. None were found after 48 hours, and the reservoir was disinfected and backfilled.

Excavation was started September 15, 1924, the first concrete poured on October 13 and the last concrete poured on November 19, 1924. The cost of the reservoir was about $90,000. It required 2,200 yards of concrete, 115 tons of reinforcing steel, 1,500 lineal feet of zinc plate for joints, 5,500 yards of excavation, 7,500 yards of backfilling, and 1 acre of black dirt and seeding.

Water Pipe Siphon Tunnel

Dredging in the Grand Calumet River necessitated the construction of an inverted siphon tunnel for carrying the 24-inch cast iron pipe leading from Chicago to Calumet City, and the section of the tunnel was made large enough for future gas lines and telephone and light cables.

The tunnel is 7 x 7 feet with an arched top and 10-inch walls. The floor of the tunnel slopes 6 inches to a sump at the south shaft for drainage. At each end of the tunnel is a 10-foot-diam-

INTERIOR VIEW OF 2,000,000-GALLON COVERED RESERVOIR AT CALUMET CITY, ILL.

eter shaft, 60 feet deep with 18-inch walls. The distance from center to center of the shaft was made 263 feet to provide for a 250-foot channel in the river. Nearly all of the excavated material was taken out of the south shaft, and it will be used for covering the sand in an adjacent park.

Shafts and Sinking.—For the first 15 feet of the south shaft the excavated material was fine water-bearing sand with a few layers of shell and gravel. In the north shaft the excavation was through black muck for about 15 feet, with a layer of gravel and shells just on top of the clay. The remainder of the shafts was clay small boulders and small pieces of slate, the clay getting harder and tougher as the shafts were deepened. Open dredging was used in the south shaft to the top of the tunnel, and then underpinning from there to the bottom. Little water was found 35 feet below the surface, although small water-bearing sand pockets were encountered. Below 45 feet the muck was excavated with pneumatic shovels and hoisted in one-half tip-over buckets.

The cutting edges of the shaft caissons for both shafts were made of 4 x 4 x ½-inch angles and 18 x ¼-inch plate with ⅝ x 36-inch anchors spaced 24 inches apart. Wood shaft forms were used, made in ⅗-foot and one 2-foot section for for each shaft. Forms were left in place for 24 hours, and after removal both the inside and the outside surfaces of the shell were brushed with a 1:2 paint-like mortar to fill all small air-holes. The walls were reinforced with ½-inch rods, 24 inches apart in both directions.

The equipment for the south shaft consisted of a small Wiley traveling derrick, 11-foot gage, with a 40-foot boom and a Clyde 7 x 10 double-drum steam hoisting engine with a Dake swinger to handle a ½-yard Kiesler clam-shell bucket. The north shaft equipment consisted of a 2-ton stiff-leg Sasgen derrick with a 36-foot boom, operated with a 12-horse-power Domestic gas-driven double-drum hoist.

As only a small amount of water was encountered, the excavation was done by hand to a depth of 40 feet. Then pneumatic shovels were used. The shelf was concreted upon the top and allowed to sink for about 40 feet and then underpinned from there to the bottom of the shaft.

Air for ventilation and for operating the Chicago Pneumatic shovels was supplied by a 10 x 10-inch Laidlaw horizontal compressor driven by a 40-horse-power Waukesha gasoline engine. A 5 x 6-foot air receiver was used for storage. Concrete for each shaft was mixed in a 7-S gas-driven Universal concrete mixer and was placed in the shaft with a ½-yard Western bottom-dump concrete bucket. Water was piped about 1,000 feet from the city water-supply. Thirty days were required for sinking each shaft, and the force for each shaft consisted of a hoisting engineer and six men.

Tunneling.—About 220 feet of the tunnel was mined from the south shaft through a hard, tough clay containing slate and small boulders. Six feet was mined and concreted in each 9-hour shift. Each shift consisted of a hoisting engineer, three pneumatic shovel miners, three muckers, and three top men. Where sand pockets occurred, the tunnel was mined, timbered, and concreted in 3-foot sections. The excavated material was handled in ½-yard buckets set on 14-inch gage Atlas cars run on a 16-pound-rail track. The buckets were used for handling both the muck and the concrete. Steel ribs were used for forms, made of 6-inch, 8-pound channel and made in two pieces, with channel iron lugs at top and bottom for bolting together with a 3-inch wood spacing block. Lumber measuring 2 x 6 inches with beveled edges was used for lagging on the steel ribs. Gravel concrete of 1:2½:4 mix was used in both shafts and tunnel. Concrete for the tunnel was shoveled and tamped into the forms. After 24 hours the forms were removed and the surface brushed with a 1:2 paint-like mortar to fill all small air-holes.

The 24-inch cast iron pipe was placed in the tunnel on wood blocks. Then concrete blocks were cast under the pipe every 8 feet. On the shafts the pipe was anchored with 7-inch, 15-pound channels spaced 6 feet apart with ¾-inch U-bolts. A 24-inch gate-valve was placed in a valve chamber at the top of each shaft. Carbic lights were used for illumination at the tunnel headings. Each shaft roof was provided with a 24-inch manhole frame and cover and a 4 x 6-inch frame and doors. A steel ladder from the tunnel floor to the valve chamber was placed in each shaft.

The Subway Engineering Company of Chicago was the contractor for the reservoir and siphon tunnel. The Public Construction Company of Hammond, Ind., was contractor for laying the pipe, and Consoer, Older & Quinlan, Inc., Chicago, were engineers for the work. The cost of the siphon tunnel was about $50,000, and it was completed in three months.

New Northwest Heat-Treating Plant

WITH the exception of the engines, the Northwest Engineering Company, 28 East Jackson Boulevard, Chicago, Ill., builds Northwest cranes, draglines, and shovels in their entirety. To their manufacturing plant they have recently added a heat-treating division. The plant now consists of a large fabricating shop where the structural steel is cut and punched, and a machine shop where all the shafts are ground at the bearings by precision grinders, the gears and pinions are cut, and the great ring gears are handled. In addition, there is the assembly shop where the machines are put together and a tool room where over $250,000 worth of special jigs and patterns are kept in readiness for repeat orders.

The new heat-treating plant will handle those parts that are called upon to withstand special strains and hard service, such as crawler pins, treads, tread link pins, the horizontal reverse shaft, rotating shaft, the crawler drive shaft, bevel gears of the vertical reverse shaft, and many minor parts which are improved through heat treating and annealing.

Legal Points for Contractors

These brief abstracts of court decisions in the contracting fields may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt, consult your own lawyer

Edited by A. L. H. Street, Attorney-at-Law

Contractor's Liability for Delay in Completing Building

Denying an owner the right to recover damages on account of a contractor's delay in completing an apartment building, the Pennsylvania Supreme Court said in the case of Lever vs. Lagomarsino, 127 Atlantic Reporter, 452:

"The contract called for completion of the building within five months, whereas it was not completed until five months later, and defendant [the owner] seeks to set off the rental value of the building during that time. While that is a correct measure of damages,....there is no competent evidence as to the rental value. True, defendant sought to show such value by two or three witnesses, whose testimony the trial judge excluded because of their lack of knowledge thereof in the locality . . . Rental value cannot be shown by the rent paid for a specific property, any more than market value can be established by the price for which certain property sold;....nor can a witness qualify himself to speak as an expert by rumor or hearsay . . . In view of this, none of those called on that question was properly qualified. There being no evidence of the amount of damages suffered by the delay, the set-off could not be allowed. Moreover, there was ample evidence to justify the conclusion that defendant waived the time limit specified for the completion of the building; but, in the absence of proof of any damage resulting from the delay, it is unnecessary to discuss that question."

Proving Character of Work as an Extra

The right of a contractor for the erection of an apartment building to recover compensation for constructing a fire-tower as an extra was involved in the case of Lever vs. Lagomarsino, 127 Atlantic Reporter, 452, lately before the Pennsylvania Supreme Court. The Court said:

"The parties prepared their own plans and specifications. Plaintiff's [the contractor's] testimony was to the effect that as planned there was only a fire-escape, and that the city authorities required the addition of a fire-tower before granting a building permit, of which requirement he informed the defendant [the owner]; that thereupon they made an oral agreement by which he was to build the tower, and the defendant was to pay him as an extra its costs plus 10 per cent. Defendant denied the oral agreement, and the evidence was conflicting; but the jury accepted plaintiff's version. If the written contract on its face included the fire-tower, there would be force in defendant's contention that the oral agreement for extra pay, if made, was for the doing of something for which plaintiff was already obligated, and hence without consideration; but there was nothing in the written contract or in the added specifications showing that the latter was embraced within the former....The uncertainty as to whether the written contract included the added specification caused a latent ambiguity, which could be explained by parol [verbal] evidence . . . . Where there is uncertainty as to what specifications are covered by a written contract, it may be explained by parol evidence, and then becomes a question for the jury."

Construction Company's Status Under Income Tax Law

On the appeal of Thompson & Binger, Inc. (1 United States Board of Tax Appeals Reports, 1095), it was decided that the company was not entitled to a computation of income and profit taxes on the basis of being a personal service corporation. The nature of the company's business, as well as the Board's conclusions, is indicated in the following opinion rendered:

"The first requirement of a personal service corporation is that its income shall be ascribed primarily to the activities of the principal owners or stockholders. The taxpayer claims that its income is to be thus ascribed; that the services it rendered in these construction contracts were those of architects and engineers. From an examination of the contracts it is evident that they contemplated, not the engineering services of the taxpayer, but the erection of a completed building, and that in these contracts the taxpayer acted in the capacity of an independent contractor. Under the contracts the taxpayer was required to furnish labor and materials and to complete the building within a designated period, and the taxpayer was to receive no compensation unless and until the buildings were completed. The engineering services rendered by the principal stockholders were only one of the factors in the performance of its contracts and the income cannot be ascribed primarily to such services."

Preliminaries to Valid Contracts for Public Work

The holding of the Mississippi Supreme Court in the case of Mills vs. Amite County (102 Southern Reporter, 465) is of more than local importance, because many other states have statutes similar to the law involved in that case. The Court held that under the Mississippi statutes, it is necessary that an engineer be employed to make an estimate of the cost of constructing and maintaining a highway or highways to be improved, and that such estimate embrace the work to be done and the approximate cost thereof, and that this survey and estimate be approved by the road commissioners and by the board of supervisors, and be entered upon the minutes of the board of supervisors, before a valid contract can be made for such work. Where there is a failure to comply with the terms of the statute, a contract made under the law is void, and the board of supervisors is not liable for the work done or the improvements made.

Security for Payment of Claims for Public Building Construction

What the Oklahoma Supreme Court said in the case of Donaldson & Yahn vs. Benight, 232 Pacific Reporter 116, concerning the law in that state is equally applicable under similar statutes in other states:

"A mechanic's lien cannot be created against public buildings or constructions in this state . . . . Section 7486, Compiled Statutes 1921, requires the proper officer, contracting for public improvements and buildings, to take a . . . . bond from the contractor in a sum equal to the contract price to be paid for the improvements, conditioned that the contractor should pay for the indebtedness incurred for labor and material furnished in the construction of the improvements or buildings. As the law denies such claimants the right of a mechanic's lien against public improvements and buildings, it was evidently the purpose of the Legislature for the bond to take the place of the lien, ... so far as practicable, in providing a remedy for those who furnish labor and material in the construction of public buildings and improvements."

Contractor's Right to Rely on Estimates

Concerning provisions in a paving contract, the Washington Supreme Court said, in the case of Wade vs. Tacoma, 230 Pacific Reporter, 99:

"When these provisions are read together, it seems to us their meaning is too plain to call for construction. The wording of the specifications and their manifest intent is that the bidder, who afterwards becomes the contractor, must examine and judge for himself as to the character and nature of the work and the labor and material required to complete the contract; that the engineer's estimates are no more than a mere guide, and the bidder must for himself determine as to their correctness, and if he accepts them unchecked and unverified, he does so at his peril. . . .

"Sympathy for the contractor, who in the face of these provisions relies upon the estimates of the engineer as to labor and material required, must not blind us to the law, or lead to the adoption of a rule, which in this particular case might relieve from an honest mistake but in the future might permit dishonesty and fraud to wax fat at the expense of innocent and helpless property owners. . . .

"A contractor, under the terms of such a contract as this, is bound to ascertain for himself the amount of labor and material required to complete the contract, ... and, having failed to do so, the city acting as the agent of the property owners has no power at their expense to relieve him by paying the excess over the estimated cost under the guise of extras, when in fact the whole work was embraced and covered by the contract."

Measurement of Work Under Ambiguous Contract

In the case of Tierney vs. Passaic Valley Sewerage Commissioners (1 Federal Reporter, 2d Series, 304), the United States Circuit Court of Appeals, Third Circuit said, concerning the measurement of work performed in constructing a sewer outlet:

"Under the contract, the plaintiff was to be paid 'for furnishing and placing straight and curved reinforced concrete outfall pipes and vertical and horizontal branches, ...$85 per linear foot.' There was a dispute as to whether, in computing the number of linear feet of pipe, the vertical and horizontal branches should be included. There being nothing in the contract that shed any light on the intention of the parties as to this, and the plaintiff having offered evidence of a trade custom under which the branches should be included, the learned trial judge left the matter, including the question of the existence of the custom, to the jury, and rightly so. The contract provision authorizing the defendant's engineer to determine, inter alia, the 'amount....of the several kinds of work and materials which are to be paid for hereunder.' vested him with authority to make measurements, but not to determine what was to be measured. 'The contract, then, not providing for the method of measurement, how shall it be decided, except by the custom of the place where the contract is made and performed?' Walker v. Syms, 118 Mich. 183, 76 N. W. 320."

Validity of Statute Making It Criminal for a Contractor to Fail to Pay Lienable Claims

A Washington statute provides that one who, "with intent to deprive or defraud the owner thereof," having any property in his possession as agent, trustee, etc., shall appropriate the same to his own use shall be punishable as for larceny. In the case of State vs. Williams, 233 Pacific Reporter, 285, the validity of the statute as applied to failure of a general contractor to discharge lienable claims on receiving the price of the work was considered. The Court upheld the law as applied to such cases, following similar rulings made by the highest courts of Wisconsin and Minnesota. A contrary holding by the California Courts is distinguished by the Washington Court on the ground that under the California lien law a contractor is not to be deemed the agent of the owner for the purpose of paying subcontractors, etc. The Washington Court said:

"The act does not provide for imprisonment for debt. The contractors are not being punished for any indebtedness which they may owe their contractee, by reason of the receipt of the contract price or any part thereof, but they are being punished for their fraud, which is an altogether different matter. The statute provides, not that the contractor shall be punished because he owes the money, but for the reason that he has secreted and failed to pay it as he should 'with intent to deprive or defraud the owner thereof,' and has appropriated it to his own use. It is the fraudulent act, and not the indebtedness, which is made the determining feature in establishing guilt under this section. . . . .

"The act does not interfere with the liberty of contract, for contractors must enter into their engagements with a knowledge of the act, just as much as they must enter into their engagements with a knowledge of the existence of the Mechanic's Lien Law."

A Practical Aid to Uniform Concrete

By Arthur A. Levison

Chief Engineer, Road Department, Blaw-Knox Company, Pittsburgh, Pa.

THE last few years have brought a keen realization that concrete as made for construction purposes is notably lacking in uniformity of quality. Over 120,000,000 cubic yards of concrete were placed during 1924. It has been estimated that the consumption of cement was sufficient to pave a concrete road 18 feet in width and of a length equivalent to 20½ times the Lincoln Highway, which extends from coast to coast. With the yearly production of concrete making so tremendous a total, the quality of the concrete produced assumes an important aspect. The lack of uniformity cannot be attributed to any lack of ability or general laxity on the part of those connected with the design, supervision, or manufacture of concrete mixing; in fact, there has been recently a concerted and energetic effort to improve the quality and the uniformity of the quality, which has been attended by some measure of success.

Standard adequate methods of test have been developed as regards the materials commonly employed for making concrete. By means of these tests we are enabled to select with a great degree of assurance the water, the sand, the stone or gravel, and the cement which are required for the mix. We can at least ascertain the quality of the materials available and form definite judgment as to their concrete-making properties. There have been developed ingenious formulae or methods for combining these materials in such a way as to provide a definite quality of the resultant concrete. The designing of concrete mixes for various materials and for various purposes has reached a stage of perfection that leaves little to be desired, for the present at least. Why, then, the deficiency of quality and uniformity in the concrete? To the close observer of construction methods as ordinarily practiced, the answer to this question is quite apparent. While the theory of concrete and concrete materials has been subject to diligent study and research, we have failed to give the proper attention to the field methods employed on the job. We have neglected to give sufficient consideration to the practical construction processes commonly employed, to the equipment ordinarily used and its limitations, and to the field control necessary to make a perfect product.

In the spring of 1924 the U. S. Bureau of Public Roads, being quite aware of the non-uniformity of the concrete entering into highway work in the various states where it administers the expenditure of Federal Aid funds, began the collection of data which would indicate just how much uniformity was being obtained. Table No. 1 gives typical data from a number of representative states. The states included in this tabulation employ what are considered to be advanced methods of construction. They have rigid specifications, and excellent laboratories for testing and research, and are noted for their high quality of construction. Yet the quality of the concrete, as evidenced by the ranges in strength from cores drilled from individual pavements, demonstrated a surprising lack of uniformity, the maximum strength being often twice the minimum and more. Another state highway department, which did not furnish the results of its tests in actual strength, reported an extreme range of strength of 34 to 174 per cent of the average strength, this occurring with drilled cores five months old at the time of test. The non-uniformity of concrete as illustrated by these data is all the more striking when it is taken into consideration that on all of this concrete paving construction the highest type of field control prevailed, specifications were exact and most rigidly enforced, and every effort was put forth to make good, honest concrete for lasting service.

The U. S. Bureau of Public Roads then circularized every state highway department in the country in an effort to secure an expression of opinion as to the reasons for the non-uniformity of concrete. Table No. 2 represents the consensus of opinion of the 27 highway departments that have had sufficient experience with concrete paving work to venture an opinion based on that experience. From this table it will be seen at a glance that by far the greater number of suggested causes for non-uniformity fall under the heading of construction processes; in fact, the suggestions under this head are almost twice as numerous as those under all the other headings combined. It is pertinent to note particularly that 21 states pointed to the various consistencies of concrete as a contributing cause of non-uniformity. No other single defect received such unanimous acclaim.

To overcome the undesirable results previously referred to, we must, for the time at least, turn from the theory of concrete to the more practical aspects of its manufacture. We should guide our research in such a manner as will result in improved methods and equipment for construction. The methods and equipment have never been developed to such a point as to counteract adequately the disconcerting variables and conditions encountered on the job. We have been making concrete in a somewhat haphazard manner and have required a large factor of safety to insure the stability of the structure. Even so, failures have been altogether too numerous. This sort of practice is not only undesirable, but utterly lacking in economy.

The manufacture of concrete consists in the mixing together of the necessary suitable ingredients in their proper proportions. The concrete is then transported and placed in the structure and allowed to harden, with protection against rapid drying and extremes of weather and temperature. Stated in this manner, the proposition does not seem to involve any great complexities, yet there are conditions which introduce difficulties in accomplishing efficiently what appears to be so simple a process.

Not many years back, it was the common practice to measure the aggregate for the batch by wheelbarrows or similar conveyances. Aggregates were stored on the job and became mixed with dirt. These conditions still prevail in some localities, but they are being rapidly replaced either by measuring boxes which are filled from overhead storage bins and struck off by hand, or

by automatic measuring devices which are also filled from overhead bins and are automatically struck off to a constant level. These advanced schemes of measuring aggregate provide more constantly accurate measurements of materials for each batch and permit cleaner aggregate to enter the work. In addition to this advantage, it has been found from experience that automatic measuring devices also provide for time- and labor-saving on the job. For this reason, equipment of this kind has found its way into construction work where it is not required by the specifications for the work. Together with these measuring devices, a calibrated tank attached to the mixer or independent of it delivers a predetermined amount of water to each batch of concrete. Yet even with these refinements of construction, there are important variables which are not fully recognized and which have a direct effect on the strength and quality of the concrete.

Weighing Supplanting Volumetric Measurement of Aggregates

The variable bulking or swelling of sand due to a fluctuating moisture content upsets the apparently correct volumetric measurements of the fine aggregate to a remarkable degree. It is possible to make volumetric adjustment for the bulking, as is being done on some work, but the degree of accuracy and uniformity of the measurement would depend entirely on the close inspection and test of the fine aggregate as it was being used. It will be necessary to vary the adjustment for bulking with the variable bulking. This would involve the necessity of making numerous troublesome changes in the volume of fine aggregate and in the measuring equipment. The construction year just passed has seen a larger amount of attention given to the measurement of fine aggregate with correction for bulking. A few examples of agencies which have only recently taken steps to compensate for the bulking of sand in concrete construction include the Missouri Highway Department, the California Highway Department, the Big Four Railroad, and the Pennsylvania Railroad. The concrete bridge built at Beck's Run by the Pennsylvania Railroad is a notable example of what can be done with proper control of the construction processes. On this job automatic volumetric measuring devices were used, the bulking of sand was corrected for, and the mix was proportioned in accordance with the fineness modulus scheme. As a result of these improved field methods, it was found possible to produce concrete approximately of predetermined strength with a reduced variation in the quality.

In 1923 the Iowa State Highway Department built two concrete paving projects, measuring the aggregate by weight. As a result of this work, weight measurements were adopted as standard practice for 1924. The chief advantage to be gained from the weighing method is in the measurement of the fine aggregate for the mix. Bulking is automatically corrected for, the sand being weighed out as so many pounds for each batch, with proper correction for the weight of contained moisture. No other major advantage can be claimed for weighing, but to-day we find the practice of weighing has spread to other branches of general concrete construction to some extent, and a number of highway departments are seriously considering abandoning volumetric measurements for weighing.

Measurement of Water

There is one striking variable which has a far-reaching effect on the quality, strength, workability, and economy of concrete. That is the measurement of the water for the batch. Even assuming that a constant amount of water is added to each batch of material, the water-cement ratio would not necessarily be constant. The reason for this is the variable moisture contained in the aggregate, particularly the fine aggregate. On a paving job in Pennsylvania with which the writer had personal contact, the amount of water contained in successive batches of sand varied from 3 to 10 per cent by weight. With a six-sack batch of 1:2:3 mix, the water content of the individual batches of sand in a four-compartment truck would vary from 30 to 95 pounds. This means that a variation of more than a cubic foot of water per batch actually existed as the batches came to the mixer. Even a good mixer operator is helpless as far as making an accurate correction for this variation is concerned. More often no correction of any kind is made, the same amount of water being added to successive batches, and a variation of almost 0.2 in the water-cement ratio results. Under such conditions, weighing of the aggregate would be of practically no value in connection with the control of the water for the mix.

"Inundation"

A construction process of recent development

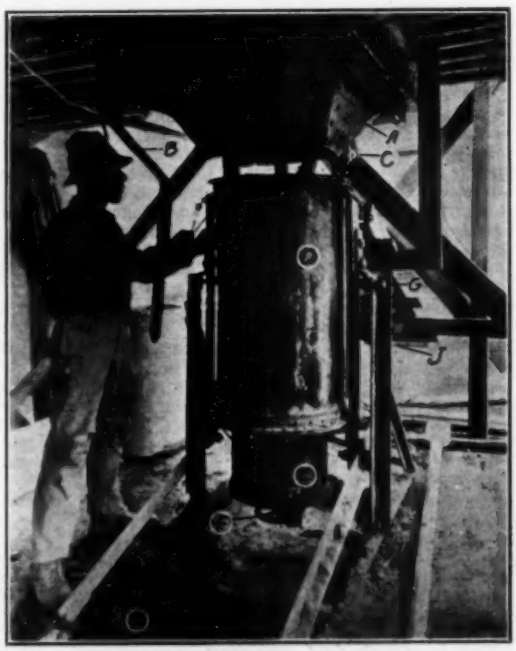


FIGURE 1. A TYPE OF INUNDATOR INVENTED BY THE WHITE CONSTRUCTION COMPANY

FIGURE 2. VIEW OF SAME PROPORTIONING PLANT SHOWING OPPOSITE SIDE OF INUNDATOR

accomplishes for the art of making concrete that which is most desirable as regards the accurate and uniform measurement of the fine aggregate and water. This process is termed "inundation" and consists in measuring the sand and water for the mix simultaneously and together in the one container or measuring device.

It has been demonstrated beyond doubt that when sand is measured in an immersed or inundated condition, the bulking action is automatically destroyed and the volume of the inundated sand is closely comparable to the volume of the same amount of sand in a dry condition. Further, the amount of water required to inundate a constant volume of a given sand remains constant. This is true regardless of whether the original condition of the sand prior to inundation was dry, moist, or saturated. It can be readily seen that with inundation properly adapted to concrete construction, two distinct advantages accrue: first, the constantly uniform measurement of the fine aggregate; and, secondly, accurately uniform measurement for each batch. Thus, two of the most troublesome constructional difficulties are solved with one stroke.

It is thought by many engineers that the volumetric measurement of sand in a loose, bulked condition is on the side of safety because it results in a richer mortar and therefore a stronger concrete. This theory is not supported by the results of tests conducted by the U. S. Bureau of Public Roads in 1924 on sample batches of concrete made up with sand measured dry and moist sand measured loose. These test results indicated definitely that for ordinary mixes concrete measured with the sand in a dry condition was equally as strong as, and in most cases stronger than, the concrete made with bulked sand measured loose. Both gravel and broken stone concrete were used in these tests. Further, the difference in yield was approximately 8 per cent with the advantage accruing to the dry sand batches. Accordingly, with sand measured in an inundated condition, there is a resultant economy with no loss of strength. This is explained on the basis that the concrete made with the sand measured in a compacted condition was denser, and the increased density more than made up for the diminution in the richness of the mortar.

The equipment for the adaptation of the inundation method to construction has always been the subject of considerable study and experimentation. Construction equipment to be successful should not only accomplish adequately the purpose for which it was intended, but should be rapid-acting, labor-saving, accurate, and durable. These requirements have placed a heavy burden on those engaged in developing the equipment necessary for applying the inundation method to the art of making concrete.

Herewith are illustrations showing various developments of the inundator, together with an explanation of their operation.

The type of inundator shown in Figure 1 has been used successfully on the construction of a large number of reinforced concrete buildings in and near New York City by the White Construction Company, who are the inventors of the process. The inundation method of obtaining accurately the correct measurement of sand and water for the mix, together with the devices for accomplishing this, are all covered by letters patent. "A" is a steel neck attached below the opening in the bin bottom of the sand storage. "B" is a lever which operates a shaker grate in the neck "A." "C" is the water-supply line. "D" is the inundator proper, which consists of a cylindrical steel container with an overflow spout near the top and a sand trap separating it from "E," the chamber in which the excess water for each batch is measured. "F" is a hand wheel which moves the bottom of chamber "E" either up or down to adjust the water measurement.

In operation, the operator turns a valve and fills the inundator with water to an arbitrary level about half-full. By working the lever "B" back and forth, the sand streams into the inundator from the bin until the container is full, the excess water overflowing from the spout and being carried off by the flume "I." A latch is released and the inundator dumped, turning on the pivot "G" and discharging sand and water into the mixer hopper "H."

Figure No. 2 is another view of the propor-

TABLE I—UNIFORMITY OF CONCRETE ON HIGHWAY WORK

State	A			B			
Project	1	2	3	1	2	3	4
Mix	1:2:4	1:2:3½	1:2:3½	1:2:3½	1:2:3½	1:2:3½	1:2:3½
Average Strength	3200	2480	3950	4080	3910	4340	3960
Minimum Strength	2340	1800	2660	3660	2840	3060	3030
Maximum Strength	4300	3860	5370	5050	5140	6420	5040

State	C				D			
Project	1	2	3	4	1	2	3	4
Mix	1:2:3½	1:2:3½	1:2:3½	1:2:3½	1:2:3	1:2:3	1:2:3	1:2:3
Average Strength	4860	4520	4380	3900	4260	5220	4810	3900
Minimum Strength	4000	2380	3020	2460	3460	4140	3980	3020
Maximum Strength	5680	6520	6570	5870	5140	5850	5980	5020

tioning plant, showing the other side of the inundator. The overflow spout is shown feeding into a wooden flume. This overflow spout is adjustable vertically on the inundator to vary its capacity. The batcher shown in the background was used for measuring the coarse aggregate volumetrically in an automatic manner. This plant, while applying the principle of inundation, does not provide the complete accuracy or automatic operation required for close control. It is possible for the operator through carelessness to overcharge the inundator. If the size of the batch were to be reduced, the overflow spout would be moved downward and an interior level used for measuring the volume of inundated sand. This is quite undesirable.

Figure No. 3 shows a development of the sand inundator previously shown, arranged to give constant accuracy, more automatic action, and speedier operation. The method of operation is substantially the same. The top of the inundator and the overflow level are fixed. Variation in capacity of the inundator is obtained by means of an adjustable bottom, which can be adjusted vertically by a hand wheel. If the inundator is overfilled with sand, no error of measurement occurs, because a strike-off gate is provided which automatically strikes off the inundated sand at the level of the top of the inundator. The inundator is pivoted so that releasing a latch allows it to dump automatically, a ratchet holding the inundator in an inverted position until it is completely emptied. On disengaging the ratchet, the inundator rights itself automatically and is ready for another batch.

With this inundator, the auxiliary water-tank is an independent device attached to the framework of the bin in a convenient position. It is quickly and readily adjustable, being fed from the water-supply line to the inundator and discharging directly into the mixer. This device is described in detail below.

In Figure 3 the inundator is shown suspended beneath the bottom of a steel storage bin, and the

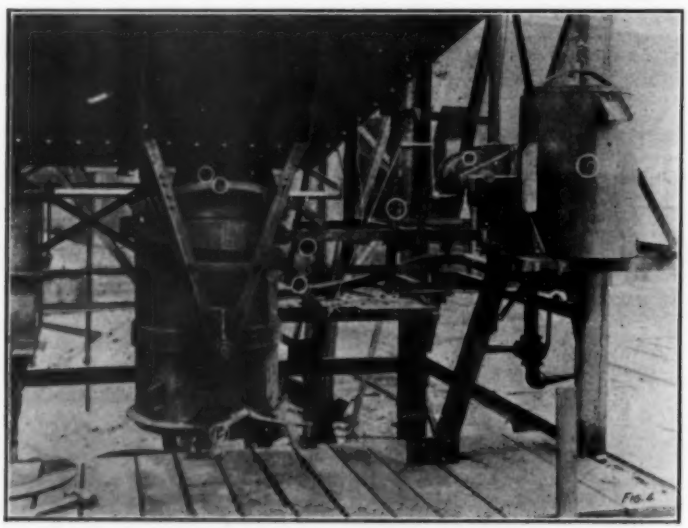


FIGURE 3. IMPROVED INUNDATOR SUSPENDED BENEATH THE BOTTOM OF A STEEL STORAGE BIN

adjustable auxiliary water-measuring tank is shown in detail "G." In this illustration the adjustment of the auxiliary water-measuring device is a winch, shown at "H," which is operated by means of a handle.

The problem of adapting inundation to other than central plant mixed concrete has not as yet been completely solved. It will be realized that for highway work where the paver is on the road, practical difficulties are encountered in connection with the hauling of the inundated sand and the water for the mix. In addition, if the wet materials are deposited in the ordinary mixer skip and the cement then added, it will involve considerable extra labor to make the skip discharge cleanly into the mixer drum. It may be that the inundated sand and water can be hauled up to the mixer in water-tight batch-boxes, substituting a batch hopper for the usual skip loader. A crane could hoist and dump a batch into the mixer hopper. The other alternative for employing the inundation method would be to construct pavements from a central mixing plant. The first weighing job in Iowa was a paving project some 20 miles in length which was successfully built from central mixing plants.

Inundation is the most logical and advantageous step of recent years to help in securing that most desired uniform quality of concrete. Uniform concrete means safe, dependable concrete. It means also better service from the structure and greater economy of construction. We can profitably turn our attention to the consideration and devising of ways and means to correct the faults attendant on concrete construction as practiced to-day. It would be of invaluable benefit if research were directed more along these channels for the development of superior schemes of controlling construction and the investigation of better methods and equipment for concrete construction.

TABLE II—SUGGESTED CAUSES FOR NON-UNIFORMITY OF CONCRETE

		State Highway Depts. Reporting
1.	*Cement*	
	(a) Variation of cement from one plant	2
	(b) Variation between different brands of cement	3
	(c) Storage of cement	1
2.	*Water*	
	(a) Variation in quality	2
	(b) Acidity or alkalinity	2
3.	*Aggregates*	
	(a) Variation in cleanliness	2
	(b) Variation in quality	2
	(c) Variation in grading	7
4.	*Construction Processes*	
	(a) Variation in consistency of concrete	21
	(b) Inaccuracy of measuring aggregates	12
	(c) Segregation of coarse aggregates in stock piles	2
	(d) Bulking of sand due to moisture	5
	(e) Segregation of concrete in mixer and in pavement	5
	(f) Variation in time of mixing	9
	(g) Oversanding	1
	(h) Arbitrary proportions	2
	(i) Insufficient tamping	5
	(j) Too much tamping	1
	(k) Use of boom and bucket on mixer	1
	(l) Variable cement factor	1
	(m) Equipment in poor condition	1
	(n) Variation in manipulation of concrete	4
	(o) Variation in thickness of pavement	1
5.	*Curing*	
	(a) Variation due to wet and dry subgrades	1
	(b) One section shaded, another exposed to sun	1
	(c) Non-uniform curing	6
	(d) Variation in nature of material used for cover	1
	(e) Variable absorption of subgrade	2
	(f) Inadequate curing	5
	(g) Absorption by dry subgrade	1
	(h) Temperature changes during construction period	3
	(i) Rise or fall of temperature during setting period	1
	(j) Effect of freezing	2

ACKNOWLEDGMENT.—Published by permission of the American Concrete Institute in advance of copyrighted Proceedings, Volume 21, 1925.

Trade Notes and Book Review

Hosken General Sales Manager for Sullivan

THE Sullivan Machinery Company, 122 South Michigan Avenue, Chicago, Ill., through its Vice-President in Charge of Sales, Howard T. Walsh, has announced the appointment of Raymond B. Hosken as General Sales Manager of Domestic Sales for that company. Mr. Hosken has been attached to the Sales Department of the Sullivan Machinery Company since 1910. After four years in the local Sales Department at Chicago, he was appointed Australasian Manager, with headquarters at Sidney, New South Wales, where he remained until 1921, when he was appointed Assistant to Mr. Walsh, at Chicago.

Fechheimer, Frank and Spedden, Inc.

S. F. FECHHEIMER, Industrial Advertising Company, 615 Wayne Street, Detroit, Mich., has announced that E. G. Frank and R. G. Spedden are joining with him in forming a new organization to be known as Fechheimer, Frank and Spedden, Inc. This organization will occupy new and larger offices at 415 Brainard Street, Detroit. Mr. Frank has been in charge of the copy department of the Campbell-Ewald Company, Detroit, and Mr. Spedden has had wide experience in merchandising and publicity, having been in charge of the retail advertising department of the same company.

Book Review

WHO'S WHO IN ENGINEERING—A BIOGRAPHICAL DICTIONARY OF CONTEMPORARIES
By John William Leonard. Who's Who Publications, Inc., New York. 1925. Second Edition. 2,483 pp. $10.00 plus postage.

The first volume of this compilation of biographical sketches was published in 1922 and contained condensed sketches from about 10,000 engineers. The first volume was invaluable in spite of the failure of some engineers to respond when asked for their histories. Since this was a pioneer in the field, there was some suspicion that it was purely a scheme to make money. A thorough investigation showed that its publication was on the highest possible editorial plane, thus bringing to it the confidence of the engineering fraternity. The present and second edition shows this confidence through the publication of 18,500 condensed biographies from an even more representative group of engineers than the first edition. The value of this publication to engineers themselves is even greater than the value of the well-known publications of this type covering a more general field. As it is confined to engineering, the reader or student of engineering knows that within its covers he will find authentic records not only of his friends and acquaintances, but of engineers of whom he wishes to know more. The editor is to be congratulated on the publication of such a representative and helpful volume for engineers.

An Interesting Sewer Job

BAY CITY TRENCHER HANDLING SEWER EXCAVATION IN BROOKLYN, N. Y.

The work illustrated on this page consists of the excavation for a vitrified segment block sewer in Brooklyn, N. Y., the contract being handled by Nazzaro & Guerriero, Inc., contractors. On the section shown along Avenue P, between Gravesend Avenue and Ocean Parkway, the entire job was handled by a Bay City Model 16-B convertible excavator with trencher scoop and crane boom and a Blaw-Knox clam-shell bucket. Because of the nature of the soil, the work could not be handled by a ladder or rotating wheel-type trencher, the top crust being very hard. The trench is cut 7 feet wide and 18 feet deep. The soil consists of 1 foot of oil-soaked macadam, 3 feet of clay, and the rest of the depth building sand with very little gravel. The trencher scoop was used for digging out the material for a depth of 9 feet. The sides of the trench were cut perpendicular, and a crew of men followed immediately behind in the open trench, placing 2-inch sheathing, held in position by 4 x 6 rangers, 16 feet long, and 6 x 6 inches x 6-foot cross-braces. After 200 feet of trench was opened up in this manner, the trencher boom was taken off and the 30-foot crane boom was placed in position. When the crane boom was in position, the machine was run up alongside the trench, 5 feet from the sheeting, and the clam-shell lowered through the trench braces, digging up the material and depositing it on the opposite side of the trench. As the trench was being dug, the sheeting was driven down to position, to prevent the sides of the trench from caving in. The machine also runs ahead where the sewer is complete and reaches across the trench with the clam-shell and backfills the trench, as desired, when it is not busy digging trench. When the trench is backfilled, this crane is also used for pulling up the sheeting. The sewer is 36 inches inside diameter, constructed of American vitrified sewer tile segment blocks

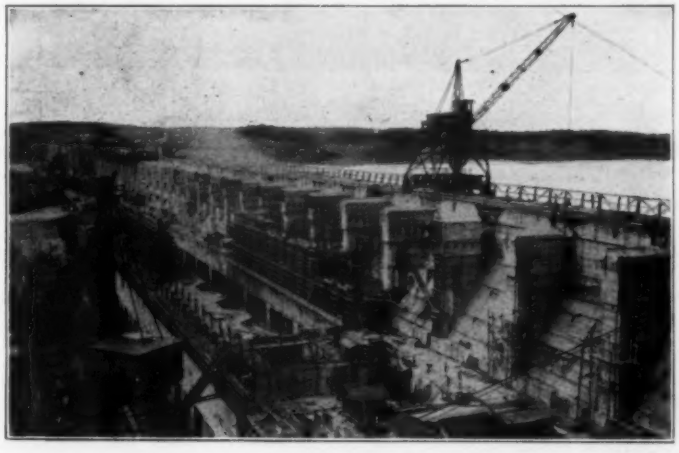
BAY CITY CRANE WITH 30-FOOT BOOM DEEPENING SEWER TRENCH

Building the Wilson Dam at Muscle Shoals

The Greatest Dam in the World—Contains 1,400,000 Yards of Concrete

IMPROVEMENT of the Tennessee River, proposed more than 100 years ago, was commenced on a small scale about 92 years ago; it was soon abandoned, but was resumed in 1890, when about $5,000,000 was devoted to navigation betterments at the most difficult point, Muscle Shoals, where the river falls 134 feet in 37 miles. In 1918 a comprehensive system of navigation and power development, dam and canal construction was begun, aggregating about $77,400,000, to create deep water in the worst part of the Muscle Shoals, and produce 860,000 horse-power for the manufacture of nitrates and for public distribution, which is feasible over a rich, undeveloped area of about 1,000,000 square miles in 32 states, and to Chicago and 24 other large cities.

The Wilson Dam and appurtenances, about 2½ miles above the Florence railroad bridge, is the principal item of this improvement, containing about 1,312,000 yards of concrete, costing about $51,000,000, and requiring a maximum force of 4,500 men for about 6 years for its construction. It will develop about 610,000 horse-power, sufficient for important and wide-spread commercial purposes, and to operate the $75,000,000 nitrate plant with a capacity of 200,000 tons of fertilizer a year or of enough explosives to supply an army of 1,250,000 men.



THE WILSON DAM AT MUSCLE SHOALS

This dam, the largest in the world, is 11.3 per cent larger than the famous Assuan dam across the Nile; 39.3 per cent larger than the great Kensico dam of the Catskill water-supply, and is the second largest masonry structure ever built, having almost half as great a volume as the vast pyramid of Cheops.

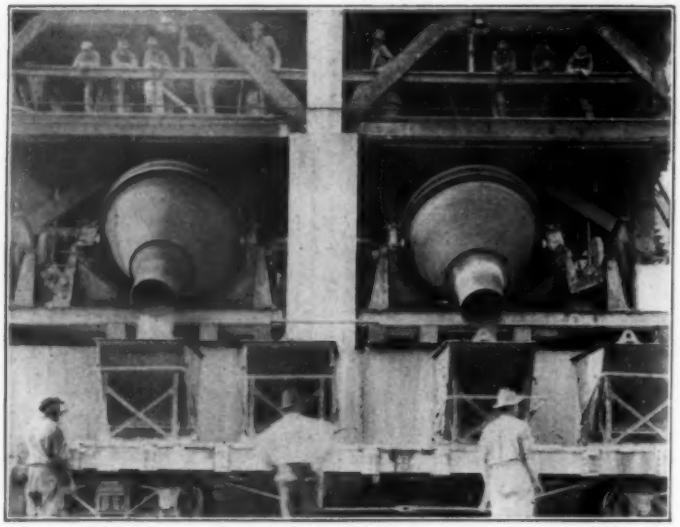
The dam, integral power-house and ship-locks of 91 feet lift, together with the miscellaneous and temporary construction involved, contain about 1,400,000 yards of concrete, enough to build an 18-foot highway from New York to Chicago, almost 1,000 miles; or to cover a 500 x 500-foot New York City block with a solid mass 150 feet high. It weighs 2,740,000 tons, the material in it requiring for its transportation 27,400 of the largest and heaviest cars, that would make a train 173 miles long and require 900 locomotives to move it.

Of this vast amount of concrete, by far the largest quantity ever used for a single structure, about 98 per cent has already been placed, and on the actual completion of the work this year, about 1,000,000 yards will have been mixed by six electrically driven Smith mixers, which will have done the work equivalent to the maximum capacity of a 1-yard machine working at top speed night and day, Sundays and holidays, every moment of each year, without stops for repairs, renewals, cleaning, moving, or delays, turning out a batch every minute, for 700 days, with efficiency that is manifestly impossible.

A single 1-yard mixer, working 24 hours a day, except Sundays, at the maximum monthly rate attained on this job would require 182 months, more than 15 years, to do what will have been accomplished in about 28 months' practical working time of the machines actually installed, making full allowance for all time lost by waiting, repairs, changes, bad weather, floods, holidays, and all other delays and interruptions.

If done by hand, the mixing alone, without any measuring or other handling of materials, would have required about 2,000,000 man-hours, or one man working 250,000 8-hour days, or 1,000 men about one average working year.

There are four principal items of concreting: 78,500 yards for the 60 x 60 x 812-foot double lock; 704,000 yards for the main dam (chiefly spillway) 3,100 feet long, 160 feet wide at the base, and 137 feet in extreme height; 530,000 yards for the combined dam section and power-house 1,250 feet long, 160 feet wide, and 134 feet high; and 87,500 yards for the piers of the service



THE NORTH SHORE MIXING PLANT, CONSISTING OF TWO 2-YARD TILTING DRUM SMITH 56-S MIXERS

bridge, foundations, and other auxiliary purposes.

The main dam, including the power-house for eighteen 30,000- and 35,000-h.p. turbine generator units of 610,000 combined h.p. and the north abutment construction, is 4,500 feet long, extending north and south across Jackson Island, and both channels of the Tennessee River, with 20 acres of foundations on solid rock in water originally showing a low-water depth of 5 to 18 feet, a current of 4 feet a second, a minimum flow of 7,350, and a maximum flow of 500,000 cubic feet per second, with extreme flood range of 33 feet.

The axis of the dam is a straight line approximately perpendicular to the shore. The spillway section has fifty-nine 8-foot wide piers 46 feet apart on centers connected by gravity section panels 38 feet long and 95 feet high, with vertical transverse expansion joints made with one or two thicknesses of tar paper at the ends. Each panel has a 35-ton, 38-foot steel crest-gate 18 feet high, operated by counterweights of constant and adjustable weights, that move vertically to regulate the discharge. Each gate has a discharge capacity of 11,800 cubic feet per second, the combined amount being three times as great as the maximum flow of the upper part of the St. Lawrence River.

The sluiceway section of the dam, 330 feet long, has a flat crest 23 feet higher than the overflow crest of the spillway section, and is pierced with 13 valved sluices 9 feet in diameter. The power-house section of the dam is of very massive construction with a gateway on the upstream side, and a 75-foot wide turbine room on the down-stream side, with foundations carried down 8 feet deeper than for the spillway section. The 18 turbine runners 12 feet in diameter will be mounted on 28-inch shafts and make 100 r.p.m., each having about 485,000 pounds of rotating parts, and at full load discharging about 3,500 cubic feet of water per second under a pressure head of 68 to 96 feet.

A highway 23 feet wide, with two trolley tracks, is carried over the full length of dam and power-house, at a height of 37 feet above the crest of the spillway sections, and is supported on concrete arches connecting the tops of the main piers. This bridge is 46½ feet wide over the spillway, and also carries an operating platform and machinery for the regulating gates.

To provide for the drainage of possible leakage through the dam, there is a 6 x 9-foot full-length inspection gallery, accessible from both sides of the river, in which are installed the pipes and valves of the drainage system, and part of those for the operation of the control-gates.

Construction operations were commenced in 1918 by the building of a standard-gage service track to connect the dam site with the railroad near the city of Florence, Ala., and by installing a preliminary service bridge on crib piers across the river just below the line of the dam. Subsequently, they were continued by building a final service bridge at a cost of about $1,000,000; building 7,000 feet of crib coffer-dams enclosing 33 acres of river bottom and removing them at a cost of $1,775,000; the installation of about $2,000,000 worth of construction plant and equipment; the employment of a maximum force of about 4,500 men, and the development of a system and appliances for handling 5,000 tons of concrete per day for continuous periods of several months.

Most of the power required for construction purposes is derived from 13,200-volt current that operates about 120 principal motors and was purchased at a maximum cost of about $10,170,000 per month. The work has been done at minimum unit costs of about 50 cents per yard for earth excavation, $4 for rock excavation, $1.31 for sand and gravel dredging and delivery, 72 cents for rock crushing, 77 cents for concrete mixing, and $8.37 per yard for mass concrete in the power-house; all these costs being for labor and material exclusive of overhead and miscellaneous charges, which add about 40 per cent to them.

Work was shut down for lack of funds from April, 1921, to June, 1922. Since that time it has

been vigorously prosecuted, and it is now about 85 per cent completed. The main offices, repair and construction shops and yards were located on the south bank of the river; large yards and a concrete-mixing plant were established on Jackson Island, and considerable plant was located on the north bank of the river. The different camps together contain about 530 principal buildings including 100 bunk-houses, 15 mess halls, 3 dormitories, housing for 300 white and colored families, recreation halls, school, and hospital, and are served by 8 miles of macadam roads and 5 miles of sewers.

The temporary service bridge parallel to the axis of the dam and adjacent to it on the downstream side, has 149 piers with crib foundations on the solid rock, that were built with 1,300 yards of concrete, six lines of steel girders to carry four standard-gage railroad tracks, and one 38-foot traveler track.

Except on Jackson Island, where they were built on dry land, the foundations for the dam and power-house were constructed in the river-bed in six coffer-dams made of double lines of timber cribs filled with rock, sheeted, and having the space between them filled with puddle. They were generally reinforced by riprap, in some cases with a surface of concrete, and were built on shore and set in place by derrick boats.

They were unwatered by centrifugal pumps, and withstood several floods, some of which submerged them, without material injury. In some cases standard-gage railroad tracks and traveler tracks were built on top of the coffer-dams, and railroads and steam shovels were operated inside the coffer-dams. The largest coffer-dam enclosed an area of about 13 acres and required for its construction 54,000 yards of puddle clay and 57,000 yards of riprap.

The surface of the flat rock in the river-bed was drilled and blasted to excavate a heel trench 16 feet deep and 35 feet wide, which was filled with concrete deposited without forms. The remainder of the foundation areas was similarly excavated to a depth of 5 or 10 feet down to solid rock strata, and the surface was thoroughly washed and grouted before concreting. Above the original level of the river bottom the concrete was placed in 7-foot lifts enclosed by wooden forms.

In the construction of the spillway section of the dam the 8-foot piers 46 feet apart were first built and the spillway panels afterwards filled in between them, except on Jackson Island, where the 48-foot sections were built monolithic in complete single, continuous operations.

Some of the spillway panels between piers were temporarily omitted to provide for the flow of the river when the first coffer-dams were removed and later ones were constructed. Eventually the river water was diverted through the sluiceways, and the panel openings were closed by stop-logs or steel gates, while the connecting lengths of the dam were concreted in successive vertical lifts.

For the spillway section of the dam, there were provided several hundred standard wooden form panels 12 feet long and 13 feet high that weighed about 2,000 pounds each and accommodated two 6-foot lifts of concrete at one setting. These were braced by permanent steel tie-rods and were removed, cleaned, oiled, and rinsed five or six times. About 3,000,000 feet of matched lumber was used for the forms, which were built, repaired, and erected by a maximum force of about 600 carpenters. In the power-house a great quantity of complicated and expensive wooden forms was required for the penstocks, scroll cases, draft tubes, concrete racks, and other purposes.

The aggregate for the concrete consisted of sand and gravel dredged from the Tennessee River about 12 miles down-stream, 20,000 yards of stone from a quarry on the north bank of the river, and a large amount of stone from the foundation excavations.

About 2,000 yards per day of sand and gravel were produced by two dredging and screening plants, delivered by barges to storage bins 9 miles distant, and then transported to the concrete mixers by side-dump cars, eight of which could be loaded in about 20 minutes.

Rock, in pieces as large as could be handled by the steam shovels, was transported from the excavations for the dam and power-house foundation to the crusher plant on Jackson Island, where it was dumped into storage, or, more generally, directly into the hopper of a 48-inch crusher,

JACKSON ISLAND CONCRETE PLANT, CONSISTING OF TWO 4-YARD TILTING-DRUM SMITH 108 MIXERS

which was operated by a 300-h.p. motor and produced about 1,800 tons of 8-inch stone in 24 hours. This product was screened, passed through four smaller crushers with a capacity of 1,200 yards in 24 hours, that were driven by four 100-h.p. motors and reduced it to 2½ inches.

The product was elevated, screened, and delivered to two elevated storage bins with a combined capacity of 480 yards. These bins delivered by gravity, through measuring boxes, to the charging hoppers of two 4-yard Smith mixing machines. At this plant the main storage of sand, gravel, and broken stone was in two long piles of materials dumped from parallel trestles 20 feet high, 70 feet apart, and 600 feet long, from which the aggregate was reclaimed by 1½-yard clam-shell buckets operated by 100-foot derrick booms. The sand was stored in a 250-yard mixer bin, from which it was delivered, like the stone and gravel, to the measuring boxes and charging hopper.

Cement was stored in a shed with a capacity for 150,000 bags, and equipped with loading and unloading belt conveyors. The bags were emptied in the cement house, the contents dumped on a 24-inch conveyor that delivered to a loose storage bin of 162 barrels capacity, from which it was delivered by gravity to measuring cars on two short, narrow-gage tracks on the charging platform, and from them was dumped into the mixer hopper.

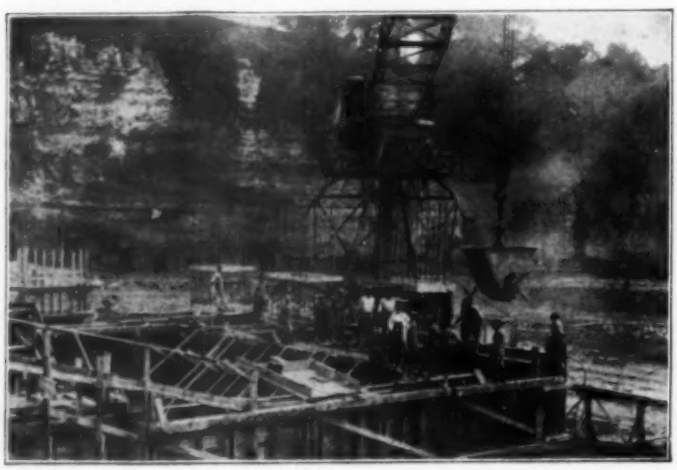
The Jackson Island concrete tower, 28 feet wide, 60 feet long and 85 feet high, supports the sand and gravel bins and below them has several floors on which are installed an equipment consisting of four 100-h.p. motors driving stone conveyors from the crusher plant and the cement conveyor, and two 100-h.p. motors driving the mixers; these are provided with starting compensators and overload relays.

There are also two 25-h.p. screen motors and potential starters, and a 7½-h.p. motor for the cement elevator, besides a two-panel switchboard, transformers, oil switches, and other electrical controlling apparatus. Other mixing plants were established on the north shore, on the south shore, and in the tail-race, besides smaller portable plants, and a pneumatic plant for grouting the rock foundation.

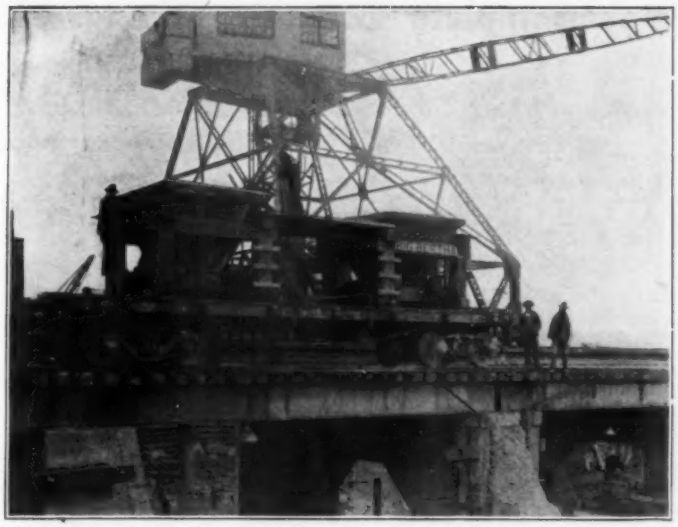
The north shore plant for concreting the locks at the end of the dam has a wooden tower with elevated storage bin filled by bucket elevators. Cement is delivered from the storage house by a belt conveyor. The two 2-yard Smith mixers are each driven by a 40-h.p. electric motor with controller, besides which the tower is equipped with three conveyors, and three power transformers, with switchboard and other apparatus. All tower mixers discharge directly into buckets transported on flat cars, pulled by standard-gage locomotives, and unloaded by the booms of derricks and travelers, by which the concrete is placed in the forms.

More than 700,000 yards of concrete was required for the spillway section of the dam, and under normal conditions was mixed at the Jackson Island and north shore plants, working two 8-hour and one 6-hour shift daily. Most of this concrete was placed by five full center tower cranes with a capacity of 10 tons at 75-foot radius, that often work in pairs, together placing a maximum of about fifty 4-yard buckets of concrete per hour. The concrete in the power-house was placed by two tower cranes with 83-foot booms and three pintle type tower cranes of 100-foot radius, and by special steel traveling gantrys having a 50-foot tower with a 95-foot overhang carrying two trolley hoists that place a maximum of 512 yards of concrete in one 8-hour shift.

The concrete is made with stone derived from the foundation excavation, and broken to pass a 3½-inch ring, of dredged gravel of the same maximum size, of dredged sand free of all vegetable material and allowed to contain not more than 7½ per cent of well-distributed clay, and of portland cement conforming to Government specifications. The proportioning of the concrete is a function of the size and grading of the aggregate. Each yard of concrete contains 25 cubic feet of broken stone or gravel, and enough sand, varying from fine to coarse, to be 15 per cent in excess of all the voids in the stone and gravel, which are tested six to nine times daily and average about 34 per cent of the volume of the latter. Five or six bags of cement are used per cubic yard of concrete and are mixed with 25 pounds of hydrated lime, which may, however, be replaced by an extra half-bag of cement. These proportions involve, for the total amount of concrete used, about 1,267,000 yards of stone, 500,000 yards



SPECIAL CONCRETE BUCKET DELIVERING CONCRETE TO FORMS



HOPPER CAR, DELIVERING CONCRETE DIRECTLY TO POSITION IN APRON ON DOWN-STREAM SIDE OF DAM

of sand, 7,700,000 bags of cement, and 17,500 tons of lime. These amounts were somewhat reduced by the use, wherever they could be placed, of quantities of large plum stones.

The average of 100 tensile tests on mortar briquettes six months old, gave a strength of 531 pounds per square inch. Every five days there were made in the field 15 concrete test cylinders and 75 mortar test briquettes. The average of 60 tests of concrete cylinders proportioned 1 : 1.4 : 4.2, with 5 per cent of lime added, gave a comparative strength of 3,038 pounds per square inch when the specimens were six months old.

Concrete is mixed until of a uniform color throughout, and for a minimum of twelve revolutions of the mixer and for a time of two minutes or more for the 2-yard mixers, and for 2½ minutes or more for the 4-yard mixers. Consistency is determined by the quaking test, which provides that only enough water is used so that men emptying the concrete buckets shall not track more than 10 inches deep or less than 2 inches in the fresh concrete.

Of the total amount of concrete used, about 1,000,000 cubic yards has been mixed in the Jackson Island plant, equipped with two 4-yard Smith mixers; in the north shore plant, equipped with two 2-yard Smith mixers and in the tail-race plant, equipped with two 2-yard Smith mixers. The maximum monthly output in mixers operating two 8-hour shifts and one 6-hour shift per day is 46,717 yards for the Jackson Island plant in July, 1924, and 21,976 yards for the north shore plant in October, 1924. The average monthly output of the Jackson Island mixers working three shifts per day and taken over a period of six months, was 25,506 yards, the maximum daily output was 1,816 yards, and the maximum output for one 8-hour shift was 834 yards.

It is estimated by the Government engineers that, under existing conditions, the maximum outputs possible for one 8-hour shift, continuously maintained, are 700 yards and 450 yards for the Jackson Island and north shore plants respectively.

The work is now being completed under the direction of Major General H. Taylor, Chief of Engineers of the United States Army; George R. Spalding, Lieutenant Colonel, Corps of Engineers, United States Army, District Engineer-in-charge; Hugh L. Cooper & Company, New York City, designing, supervising, and inspecting engineers.

Courses in Structural and Mechanical Engineering

CORRESPONDENCE courses in structural, highway, and hydraulic engineering, as well as in subjects concerned with the different phases of mechanical and electrical engineering, are now offered by the Division of University Extension, Massachusetts Department of Education, at a nominal cost. Concrete and its uses, reinforced concrete construction, steel building design, steel bridge design, highway construction and maintenance, hydraulics, and studies in mechanical engineering are among the courses offered.

Previously, only residents of Massachusetts were allowed to take the courses, since they are given by a state department, but recently the State Legislature passed a bill allowing all residents of the United States and Canada the privilege of enrolling as correspondence students. The set fee for each course is regulated by the amount of text material used, the cost of postage and cost of instruction. Since no profit is made, the charge is the lowest possible. Complete information may be secured from James A. Moyer, Director, Division of University Extension, State House, Boston 9, Mass.

A Complete Concrete Mixing, Hoisting and Spouting Plant

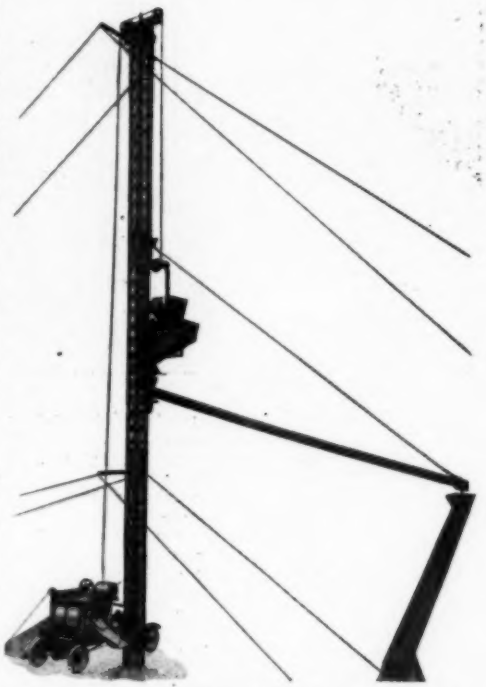
Portable Mixer Operates Entire Job

THE latest concrete mixing, hoisting, and spouting plant that has come to our attention is the No. 107 hoist tower outfit made by the Archer Iron Works, 34th Place and Western Avenue, Chicago, Ill. The outfit consists of a bottom section of steel tower 20 feet high and as many intermediate steel tower sections as required, each section being 20 feet high, and a top section of steel tower 20 feet high. The maximum height of the tower, guy-supported, is 140 feet, but towers of greater height can be used where they can be rigidly fastened to a building. With each outfit an Archer patented hoist bucket is furnished. This bucket dumps into a receiving tower hopper fastened to a sliding frame which moves up and down one face of the tower to pour concrete at the different heights required. The hopper is provided with a gate to regulate the flow of concrete into chutes or cars. Two top sheaves, 14 inches in diameter, with boxes and one bottom 14-inch swivel sheave are furnished by the manufacturers with each outfit as standard equipment.

Each tower outfit is provided with a 30-foot steel gin pole for erection purposes. This pole is fastened to a steel sliding frame to slide up one face of the tower, and is quickly raised from one height to another to raise new sections of tower. When the tower is raised the full height, the gin pole is lowered and laid aside until the tower is dismantled.

The steel tower hoist boom plant can be used to advantage where it is more economical to spout the concrete directly to the forms or run a line of chutes to a floor hopper located at a central point and wheel the concrete from the floor hopper. This plant consists of the regular steel tower, bucket, tower hopper, etc., and a 30-foot boom spout, the hopper end of which is supported by the sliding frame, supporting the tower hopper. The discharge end of this spout is supported by a cable attached to a sliding frame above. The hopper end of an additional 30-foot spout can be supported by a hook on the discharge end of the boom spout. The discharge end of this spout pours direct into the forms or floor hopper. Where additional spouting is required, the discharge end of this spout is supported by an A-frame or wooden horse. The first two 30-foot lengths of spouting, together with the tower hopper, are raised as one unit.

To serve this No. 107 hoist tower outfit, the Archer Iron Works has developed a plant which eliminates the necessity of having a separate mixer and separate hoisting outfit with a man to operate each outfit independently. The Archer Auto-Mixer mounted on a Ford 1-ton truck chassis and provided with a side loader hopper and extra hoist for raising the 7-cubic-foot bucket, filled with concrete, makes a neat combination. The fact that the Ford is provided with a niggerhead and can be easily moved under its own power from one location to another, makes it indispensable in raising the various lengths of the tower economically. When the outfit, including the chute, is set up in position for pouring concrete, the Auto-Mixer is backed toward the tower and the concrete is mixed and discharged into the hoist bucket with the short chute provided and the bucket raised by the hoist on the Auto-Mixer. The Auto-Mixer, hoist, and niggerhead are all driven from the Ford engine by means of the Archer power take-off, which provides plenty of power for mixing and hoisting. The Auto-Mixer unit, which has been described in this magazine before, is self-contained and requires only one operator to run the mixer and hoist the concrete bucket.



A COMPLETE STEEL TOWER HOIST FOR CONCRETING

The No. 114 steel tower outfit requires a ½-yard mixer and separate hoists for raising the concrete bucket.

On both outfits guy-wires are placed every 40 feet of the tower height and at an angle of 45 degrees to the tower. Wire rope ⅜-inch in diameter may be used for a plant without chutes, and ½-inch diameter wire rope for a plant with chutes. For raising the tower section, two 8-inch double pulley blocks of ¾-inch diameter manila rope should be used, and for raising the gin pole, two single 8-inch pulley blocks with ¾-inch manila rope are suitable.

Helpful Catalogs

The catalogs and pamphlets listed below are available for free distribution. Contractors and Engineers who check over these pages each month and write for such material as interests them, will find this a valuable means of keeping up-to-date on the subject of machinery and equipment.

STEEL TRUCK BODIES WITH RENEWABLE FLOORS

Mack Trucks, Inc., International Motor Co., 25 Broadway, New York City, has developed a steel body with a renewable combination steel and wood floor which is capable of withstanding the shocks of overhead loading. This body is described in Bulletin 1255, which may be secured free on request.

A STREET SPRINKLER TANK FOR ONE-TON TRUCKS

Bulletin No. 146 issued by the Heil Co., Milwaukee, Wis., describes the Heil street sprinkler tank for mounting on the standard Ford 1-ton truck chassis.

POWER SHOVELS BACKED BY EXPERIENCE

Osgood power shovels built in from ¾ to 6-yard capacities and backed by 50 years' experience in designing excavating machinery, are completely described in the literature of the Osgood Co., Marion, Ohio.

IMPROVEMENTS IN 21-E PAVER

The Koehring 21-E heavy-duty paver, which has had many improvements built in the 1925 model, is described in literature which may be secured free from the Koehring Co., Milwaukee, Wis.

SPECIAL WATERPROOFING

Information Service Bulletin No. 3 issued by Lewis Asphalt Engineering Corp., 30 Church St., New York City, manufacturers of Karnak waterproofing, tells the very interesting story of the difficulties encountered in waterproofing the reflecting pool between the Lincoln Memorial and Washington Monument, South Potomac Park, Washington, D. C.

CRAWLING TRACTOR CRANE WITH INDEPENDENT FUNCTIONS

A locomotive crane of the crawler type, known as Industrial Type-DC, which has many new features increasing its ease of operation and serviceability, is described in full in the latest literature of Industrial Works, Bay City, Mich.

MACHINE FINISHER FOR CONCRETE ROADS

Machine finishing of concrete roads is required now in many specifications. The Ord concrete road finisher, which gives better work at lower cost, is described in full in a bulletin which may be secured from A. W. French & Co., 208-212 North Clinton St., Chicago, Ill.

ROAD-BUILDING EQUIPMENT

Under this title the Blaw-Knox Co., Pittsburgh, Pa., has issued a 28-page, well-illustrated booklet filled with descriptions of the complete line of Blaw-Knox equipment, including clam-shell buckets, steel forms for roads and streets, batcher-plants, steel bins, adjustable measuring batchers, truck turntables, and portable steel buildings.

GAS-DRIVE POWER SHOVEL FOR CONTRACTORS

The new Model-4 Keystone traction excavator with front-crawler tread and skimmer ⅝-yard or bottom-dump ditcher buckets, or pull stroke ditcher, is described in a well-illustrated catalog, Second Edition, 1925, which may be secured from the Keystone Driller Co., Beaver Falls, Pa.

AN UNUSUAL CONCRETE MIXER CATALOG

Catalog No. 500 issued by the T. L. Smith Co., Milwaukee, Wis., is a very complete illustrated catalog printed in colors, telling the whole story about Smith concrete mixers and pavers, and showing many jobs of different types in which Smith mixers of various sizes have been used successfully.

WAGON LOADER CUTS OVERHEAD

Barber-Greene wagon loaders have speeded work approximately 150 per cent on many road jobs and thereby cut down overhead costs. Just how this is accomplished is told in "Contracting with Barber-Greenes," which is an interesting selection of paving and contracting layouts which may be secured from the Barber-Greene Co., 482 W. Park Ave., Aurora, Ill.

A 92-CUBIC FOOT AIR-COMPRESSOR

A complete gasoline-engine-driven 1925 model air-compressor unit of 92 cubic feet capacity, has been placed on the market by the Domestic Engine & Pump Co., Shippensburg, Pa., and is described in full in its specifications.

SEWERS THAT MEET SEVERE CONDITIONS

A booklet, "Are You Building Sewers That Will Meet These Conditions?" has been issued by the Clay Products Assn., 133 W. Washington St., Chicago, Ill., and forcibly shows the strongly acid and alkaline substances which are discharged into sewers from various industries.

SMALL ROAD ROLLER HANDLES VARIED WORK

In its new 32-page illustrated Catalog P, the Austin-Western Road Machinery Co., 400 N. Michigan Blvd., Chicago, Ill., describes in full the Austin Pup, which with its maintainer and scarifier attachments takes the place of a road roller, a scarifier, a maintainer, a snow-plow, and a tractor in many kinds of work.

SWINGING ENGINES

Dake swinging engines, which produce quicker swings and more work and give less trouble, according to the experience of many contractors, and which are used on so many types of bull-wheel derricks, are described in full in the catalog of the Dake Engine Co., Grand Haven, Mich.

LOW PRICES ON STANDARD EQUIPMENT

Subject to prior sale, the Industrial Plants Corp., Forest 600, Toledo, Ohio, is offering a limited number of new standard Austin pavers, mixers, and cranes at a discount of 25 to 50 per cent. Prices and catalogs containing complete descriptions of these machines will be sent promptly on request.

A SELF-FEEDING WAGON LOADER

The Specialty self-feeding wagon loader, which is mounted on a Fordson tractor, and speeds up the job and cuts the cost, is described in detail in the literature of the Specialty Engineering Co., Alleghany and Trenton Aves., Philadelphia, Pa.

A 4-CYLINDER MOTOR ROLLER

The Huber 4-cylinder motor roller, from which the last traces of jerky, noisy, and uncertain gas engine design have been eliminated and which has a lower center of gravity, economy of operation, and a compressed-air scarifier, is described in full in the literature of the Huber Mfg. Co., 106 Center St., Marion, Ohio.

A STEAM SHOVEL WITH MORE POWER

Bulletin No. 68 which has recently been issued by the McMyler-Interstate Co., Bedford, Ohio, contains a great deal of information regarding the company's No. 2 steam shovel, which claims the distinction of having the largest grate and boiler of any shovel of its rated capacity.

AN ENGINE THAT SHOWS THE WAY

The Climax engine, which is specially built for the operation of contracting machinery, is constantly handling jobs which some one has said cannot be done. The catalog of the Climax Engineering Co., 11 W. 18th Ave., Clinton, Iowa, tells all about this "Trustworthy" engine.

ALL-STEEL TRACTOR DUMP-TRAILERS

La Plant-Choate all-steel tractor dump-trailers of 5 yards capacity, which stand up under hard usage over rough roads, are described in catalog M, which may be secured from the La Plant-Choate Mfg. Co., 3515 First Ave., Cedar Rapids, Iowa.

HIGH-POWER TANDEM ROAD ROLLERS

Iroquois tandem rollers, with high power, quick reverse, long life, and low maintenance cost, and made in four sizes, are described in complete specifications which may be secured from the Iroquois Sales Dept., the Barber Asphalt Co., Land Title Bldg., Philadelphia, Pa.

PORTABLE BOILERS FOR CONTRACTORS

Cast front portable boilers on wheels, as well as vertical boilers on wheels for use in running contractors' steam machinery, are described in literature which may be secured from E. C. Robinson, Treas., Nagle Engine & Boiler Works, Erie, Pa.

TOPOGRAPHY FROM AERIAL PHOTOGRAPHS

Bulletin No. 2 recently issued by Fairchild Aerial Surveys, Inc., 136 W. 52nd St., New York City, is a reprint of a valuable article on this subject which should interest engineers and city officials.

FLAT-ROOF SPECIFICATIONS

Volume 1 of the Architects and Engineers Built-Up Roofing Reference Series, published by The Barrett Co., 40 Rector St., New York City, for free distribution among engineers, architects, contractors, and city officials, contains valuable information written in the form of specifications for built-up roofing on flat roofs.

ECONOMICAL STEEL TIES FOR STREET RAILWAYS

In a 24-page illustrated booklet the International Steel Tie Co., Cleveland, Ohio, describes its steel Twin-Tie tracks, which offer many savings and advantages in street railway construction and maintenance, of interest both to the railway company and to the city.

STEEL JOISTS FOR SAFETY AND PERMANENCE

The use of Truscon steel joists for economical, fireproof, safe, and permanent building construction is outlined in a new bulletin, No. 555, which may be secured from the Truscon Steel Co., Youngstown, Ohio.

A NEW ADJUSTABLE SHORE

A light-weight, adjustable shore that has no parts to be lost and which, because of its metal construction, will last indefinitely, is described in literature which may be secured from the Symons Clamp & Mfg. Co., 2449 N. Sheffield Ave., Chicago, Ill.

NEW BULLETIN ON PNEUMATIC HAMMER DRILLS

Bulletin 81-F is a new edition of the Sullivan catalog on rotator hammer drills, which are made in seven styles for one-man operation. Copies of this bulletin may be secured from the Sullivan Machinery Co., 122 S. Michigan Ave., Chicago, Ill.

A NON-SPLASHING TRENCH PUMP

The "Mud Hen" diaphragm pump built by the C. H. & E. Manufacturing Co., Inc., Milwaukee, Wis., has a long discharge end which leads the water away from all the working parts. This pump is described in an illustrated bulletin which may be secured from this company.

MIXER EQUIPMENT FOR CONTRACTORS

The Lansing Co., Lansing, Mich., has issued a well-illustrated 40-page catalog, No. 18-CE, which it will be pleased to send to contractors interested in various types and sizes of gasoline- and steam-operated mixers with side-loading hoppers, automatic water-tank, and other advantageous features.

A NEW 20-TON GASOLINE LOCOMOTIVE

The new 20-ton Model Davenport gasoline locomotive, which has more attractive lines and no hang-overs from steam locomotive design, is described in the most recent literature of the Davenport Locomotive Works, Davenport, Iowa.

DITCHING WITH DYNAMITE

This is the title of a well-prepared 35-page booklet recently issued by E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del., for free distribution among contractors and engineers interested in this economical and quick method of providing adequate drainage ditches in locations where excavation is not easily handled by machine.

PORTABLE AIR-COMPRESSORS

Catalog C-25-A recently issued by Schramm, Inc., West Chester, Pa., describes the complete line of Schramm portable engine-driven and motor-driven air-compressors, as well as its Fordson compressor unit and outfits for truck mounting.

STEEL DUMP BODIES FOR FORDS

Steel dump bodies for Ford truck chassis, manufactured by the Marion Steel Body Co., Marion, Ohio, are priced low and built sturdily and have automatic dumping mechanisms. They are described in a folder which may be secured free on request.

PRICES REDUCED ON LOADERS

The price of the Link-Belt Type-C loader made by the Link-Belt Co., 910 S. Michigan Ave., Chicago, Ill., for handling sand and gravel, has been reduced. This outfit is described in full in a recent folder which may be secured free from this company.

A SELF-PROPELLING AIR-COMPRESSOR

The Curtis-Fordson portable air-compressor, a reasonably priced self-propelling unit that every contractor can use for road drilling, trenching through pavements, backfilling, tamping, or any of the other jobs where air tools can be used, is described in the literature of the Curtis Pneumatic Machinery Co., 1671 Kienlen Ave., St. Louis, Mo.

A 4-CYLINDER INDUSTRIAL TYPE ENGINE

Bulletin No. 493 recently issued by the Buda Co., Harvey, Ill., describes this company's new model JVU 4-cylinder engine with 5¾-inch bore and 7½-inch stroke, capable of developing from 50 to 83 horsepower.

AN ELECTRIC CAPSTAN CAR PULLER

The Clyde Iron Works Sales Co., Duluth, Minn., will be pleased to send literature fully describing its new improved electric capstan car puller to any contractors or material-men interested in this sturdy equipment for permanent yard installation.

A TEXT-BOOK ON HAND SHOVELS, SPADES AND SCOOPS

C. L. Butts, Sales Manager, The Wood Shovel and Tool Co., Piqua, Ohio, will be glad to send to those interested a copy of this company's handsomely illustrated 50-page booklet regarding H. K. Wood's Mo-lyb-den-um super-steel shovels.

STEAM SHOVEL CHAIN

The S. G. Taylor Chain Co., 140 S. Dearborn St., Chicago, Ill., has issued a loose-leaf booklet containing information on the manufacture and proper lubrication of steam shovel chain which should be of interest and value to contractors.

A CRAWLER WHEEL FOR FORDSONS

The Grid-Iron-Grip wheel, built on the crawler principle, giving 50 per cent more draw-bar pull for Fordson tractors, is described in an illustrated folder recently issued by the Tractor Grip Wheel Co., 4082 Detroit Avenue, Toledo, Ohio.

MACHINE SCREEDS WITHOUT TAMPING

The Lakewood screed, which spreads and belt-floats concrete roads where tamping is not required, is described in Bulletin 42-F issued by the Lakewood Engineering Co., Cleveland, Ohio.

TIME-SAVING CONCRETE MIXERS

To the contractor time saved is a great factor in assuring a profit on the job. The Panama line of concrete machinery manufactured by the J. B. Foote Foundry Co., 32 Front St., Fredericktown, Ohio, and described in its catalogs, insures a greater day's work with less labor, effecting a double saving for the contractor.

A CRAWLER TREAD FOR FORDSONS

The full story of how the Trackson Full-Crawler tread increases the tractive power of the Fordson tractor 30 per cent is told in the literature of the Full-Crawler Co., 500 Clinton St., Milwaukee, Wis.

UNFAILING GOVERNORS FOR CONTRACTORS' EQUIPMENT

Pickering governors, which have been the choice of contractors for some time because of their unfailing reliability, are described in Bulletin No. 35 which may be secured from the Pickering Governor Co., Portland, Conn.

A DOUBLE-DRUM HOIST FOR FORDSONS

The double-drum White hoist, which is built into the rear axle of the Fordson, giving a 12-inch drum on the left side and an 8-inch drum on the right, particularly adapted for dragline work in gravel-pits and cellar excavating and for general contracting, is described in a folder which may be secured from the Oklahoma Engineering Co., Muskogee, Okla.

INDUSTRIAL-TYPE TRACTOR FOR CONTRACTING

The McCormick-Deering industrial tractor, which has sliding-gear transmission with three forward speeds and one reverse and is particularly adapted to many types of contracting work, is described in literature which may be secured from the International Harvester Co. of America, 606 S. Michigan Ave., Chicago, Ill.

THE A. B. C. OF METAL LATH ERECTION

This is the title of an instructive folder which has been issued for free distribution among contractors and architects by the Associated Metal Lath Manufacturers, 123 W. Madison St., Chicago, Ill.

A JUNIOR SIZE ROAD ROLLER

The Junior road roller of the 3-wheel macadam type in 3-, 4-, and 5-ton sizes, using a Fordson tractor from which the front truck and rear wheels have been removed, is made by the Galion Iron Works & Mfg. Co., Galion, Ohio, and is described in full in its literature.

CONTRACTORS' UNLOADING EQUIPMENT

The Fairfield Engineering Co., Marion, Ohio, in its Bulletin No. 40 describes the complete line of Fairfield unloaders for handling gravel, stone, and sand, as well as their loading bins and batchers.

PRE-CAST CONCRETE SLABS FOR ROOFS

The Federal Cement Tile Co., 608 S. Dearborn St., Chicago, Ill., has issued a well-illustrated 32-page book replete with blue-prints describing Federal pre-cast reinforced concrete interlocking-type tile for all types of roof construction.

TRAILER TYPE TILTING MIXERS

Packard Tilter Trailer mixers, particularly for use with Ford trucks, are illustrated and described in the mixer catalog of the American Cement Machine Co., Inc., Keokuk, Iowa.

AN 8-INCH DREDGE DELIVERING SAND AND GRAVEL DIRECTLY TO SCREENS

The Field of Service for Dredging or Sand Pumps

Hydraulic Dredging and Sand Gravel-Dredging Plants Offer Field for Contractors

THE purpose of a dredging or sand pump is to handle a mixture of solid material and water. Its earliest application was in dredging mud and sand from navigable waters, from which it has derived its name. At present, aside from dredging proper, these pumps are used for many different purposes on construction work, and notably for sand and gravel plants.

Hydraulic Dredging

The earliest application of dredging pumps was in dredging out harbors and channels for navigation. At present, hydraulic dredges are used mainly for this purpose and can be found in all large ports and navigable waters. The merits of hydraulic dredging have been thoroughly demonstrated, as the most economical method for handling large quantities of sand, gravel, slit, clay, etc., and, in fact, all classes of material except hard rock.

The particular advantage possessed by a hydraulic dredge is that it can be used both to excavate and to deliver the excavated material direct to its destination in one operation without any subsequent rehandling. This feature is utilized frequently in improving the adjoining low lands by filling.

Hydraulic dredges differ widely in design and size, depending on their purpose and the condition under which they are to be operated. As usually constructed, the hydraulic dredge consists of a dredging pump with a revolving cutter or agitator on the suction and of the power-plant and auxiliaries required for the operation and handling of the dredge, all being mounted on a suitable hull. The usual auxiliaries are a five-drum hoist, used for raising and lowering the suction and for operating the spuds and swinging lines, and a small water pump for water service to the dredge pump and for general uses on board.

In operation, the material is cut up by the revolving cutter on the end of the suction pipe and is sucked up into the pump with the water. From there the pressure developed in the pump forces the resulting mixture of material and water through the discharge pipe to its destination.

The position of the dredge is controlled by means of two spuds off the stern and two swinging lines off the bow. A cut is made by swinging the dredge about one of the spuds by means of the two swinging lines off the bow, these being attached to anchors or ashore. This cut is in an arc of a circle, the center of which is the spud. The depth of the cut is regulated by raising and lowering the ladder carrying the cutter and the suction pipe. Advance forward is made by "walking," that is, by swinging the dredge over to one side of the cut and changing the spuds.

The discharge pipe is carried ashore from the dredge on pontoons, the different lengths of pipe being connected up with flexible couplings.

The power for operating the dredge may be steam, electric current, or internal combustion engines, depending on the conditions. A steam-driven dredge can be operated wherever fuel can be supplied to it, and is the most flexible all-round unit. Electrically driven dredges are very economical and are being used more and more, but, of course, can be operated only within reach of the power cable. Internal combustion engines, especially of the diesel and semi-diesel types, have been used successfully on some of the recently constructed dredges.

The usual sizes of hydraulic dredges are 10-inch, 12-inch, and 15- and 20-inch, these being the sizes of the dredging pumps and discharge pipe employed. The capacity is dependent upon the material in question and the distance and head against which the dredge delivers. For average conditions, however, the output can be estimated at 90 cubic yards per hour for a 10-inch dredge, 125 cubic yards per hour for a 12-inch dredge, 200 cubic yards per hour for a 15-inch dredge, and 350 cubic yards per hour for a 20-inch dredge.

Sand- and Gravel-Dredging Plants

Hydraulic dredges are employed very widely in the production of sand and gravel for concrete. The material is usually pumped direct to the screen and dewatering tanks, arranged at some height above the ground, where it is sized and graded and then loaded by gravity to storage bins or direct to the cars, while the water is returned to the pond by sluiceways. As the material is pumped with about ten times its volume of water and becomes thoroughly agitated in traveling

through the pumps and pipe lines, it requires no further washing after dewatering.

The dredging of sand and gravel differs from the ordinary hydraulic dredging in that the deposits of suitable material are practically always loose and require very little cutting up or agitation. The material is highly abrasive and causes heavy wear in the pump and the pipe line, and when pumping to the screening plant on shore, the required head is usually very high.

On account of the material's being loose, the majority of sand- and gravel-pumping plants are equipped with only a plain suction without any cutter or agitator and depend upon the suction force of the pump to pick up the solid material from the bottom. This simplifies the whole situation and is quite satisfactory in most cases. However, to combat occasional streaks of hard material and to prevent the choking up of the suction with stones and boulders, and to insure a steady flow of material, many of the sand and gravel dredges are equipped with jet agitators or traveling suction screens.

To withstand the highly abrasive action of coarse gravel, the pump parts are usually made of wear-resisting material, such as high-carbon steel or manganese steel. When the required total head is excessive for one pump, another dredging pump, commonly called the booster pump, is installed on the shore, and the pump on the dredge delivers to the suction of the booster pump, while the booster pump delivers to the screen. The pump on the dredge and the booster pump are usually made identical.

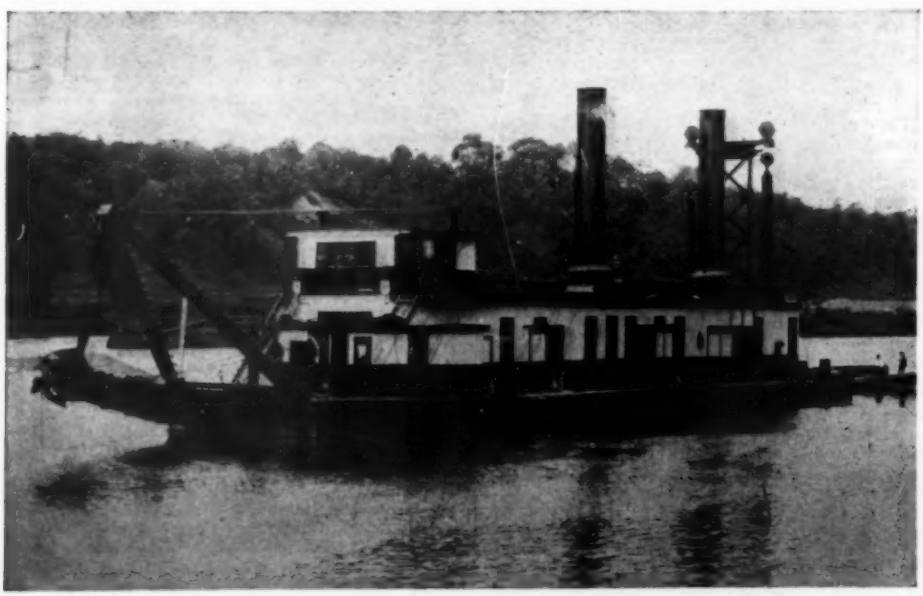
The sizes of pumps employed in the sand and gravel production vary from 4-inch to 20-inch, the most common sizes being 10 and 12-inch.

The Selection of Dredging Pumps

Because of the many special features connected with the operation of a dredging pump, care must be exercised and experienced manufacturers consulted. Dredging pumps are usually made with the same size suction and discharge and are normally rated for an output of 10 per cent solids and 12 feet per second velocity through the discharge. That is, a 12-inch pump is made with a 12-inch diameter suction and discharge and is rated at 4,200 gallons per minute and 125 cubic yards of solids per hour. The actual output will vary widely, depending on the material and conditions. The Morris Machine Works, Baldwinsville, N. Y., manufacturers of an extensive line of sand and dredging pumps and hydraulic dredge machinery, recommend installing as large a pump as practicable. The cost of operating is less in proportion for the larger pumps. Consideration should also be given in the selection of a dredging pump to the size of the material it is intended to pump; that is, the pump selected should have sufficient clearances to pass through the maximum size solids it is proposed to pump.

The heads specified in pump manufacturers' tables are the total heads against which the pumps can deliver at the specified speed. This total head is the sum of actual lift above the water surface and of the friction losses in the suction and discharge. Liberal allowances should be made in figuring, and the maximum conditions should be assumed. Where the total is expected to vary widely, some provision should be made to vary the speed of the pump.

When the total required head exceeds that allowable for one pump, additional pumps or boosters should be used on the line and the total head divided evenly between them.



A 20-INCH MORRIS DREDGE AT WORK ON THE NEW YORK STATE BARGE CANAL
This dredge has successfully handled gravel and boulders through pipe lines over a mile in length

A 16-INCH MORRIS ELECTRIC-DRIVEN DREDGE USED FOR LEVEE CONSTRUCTION AT KANSAS CITY, KANS.

This dredge was designed to deliver through 3,000 feet of pipe line with a 40-foot lift

A dredging pump can be either belted, geared, or directly connected to the prime mover. Where the speed of the pump is suitable, it is recommended that the pump be directly connected to the prime mover.

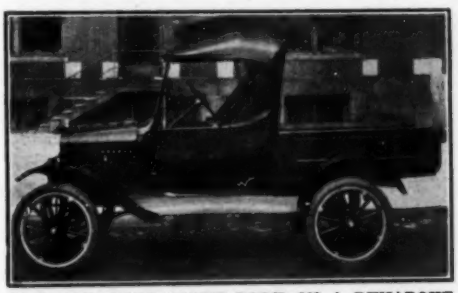
The life of the wearing parts in the dredging pump is dependent on the material of which these parts are made, the material handled, and on the total head against which the pump is delivering. The greatest wear occurs when pumping coarse, heavy gravel against a high head. Pumps with heavy steel wearing parts are recommended for this class of service.

The hand of the pump, either left-hand or right-hand, and the position of the discharge, should be selected to secure a correct direction of rotation and the shortest and most direct pipe and connections.

New Ford Delivery Truck

Runabout Is Equipped with Pick-up Body

THE Ford Motor Company, Detroit, Mich., has announced a new light trucking unit, the equipment of which is a combination of the standard Ford runabout with the rear deck replaced by a pick-up body. This truck is particularly valuable for rapid transportation of light loads, such as are common in municipal water, sewer and electric departments and for contractors. There is an all-steel body available securely attached to the frame of the chassis with rear-door adjustable chains, side flanges and steel floor strips with sunken bolt heads. The inside dimensions of the body are 40¼ inches by 56 inches, and the height from the floor to the top of the flare is 13 inches.



THE NEW FORD LIGHT BODY ON A RUNABOUT CHASSIS

New Line of Four-Cylinder Pneumatic Drills

THE Ingersoll-Rand Company, 11 Broadway, New York City, has announced a new line of 4-cylinder pneumatic drills, including both reversible and non-reversible sizes. These machines contain many features which tend to give greater reliability, more efficient operation and reduced drill maintenance cost.

The drills are said to be the only ones equipped with speed governors which automatically prevent racing the drills beyond a safe working speed. The governor saves on air consumption and prevents wear and tear on the drill parts. In tapping and reaming it avoids burning the taps and reamers.

A 1925 Model of 92-Cubic-Foot Air-Compressor Unit

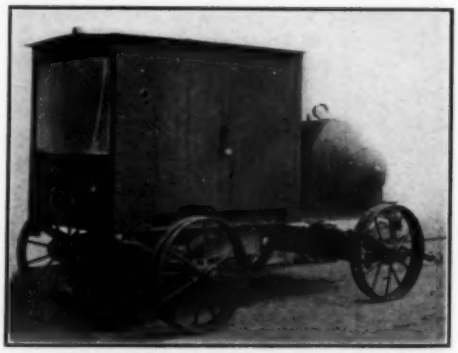
Fully Equipped Outfit Has Standard Equipment

THE 1925 model of the Domestic 92 cubic-foot air-compressor unit which has been announced by the Domestic Engine & Pump Company, Shippensburg, Pa., is powered with a 2-cylinder engine of 5-inch bore and 6-inch stroke, rated at 17 horse-power. The compressor is of the one-cylinder type with 6½-inch bore and 6-inch stroke. The engine and compressor run at the same speed at a maximum of 800 r.p.m. and a minimum of 610. The air displacement of the compressor is 92 cubic feet per minute at 800 r.p.m., and 70 cubic feet per minute at 610 r.p.m.

The air receiver tank measures 20 x 35½ inches and is made of riveted steel with ¼-inch steel for the shell, 3/8-inch in the concave head, and 5/16-inch in the convex head. The tank is fitted with fusible plugs, a safety blow-off valve, and a large drain-cock, as well as discharge air hose connections and valve.

The carburetor is equipped with two butterfly valves which are controlled by two separate governor devices. One of the devices is of the fly-ball type, enclosed in a dust-proof housing, and runs in oil. It can be set to run the engine under load at any speed between the extremes of operation. The second governor is controlled by a plunger piston in the unloading device and acts only when the air pressure in the air receiver tanks approaches the pressure for which the unloading device is set to operate. The function of this second governor is to prevent temporary racing when the air discharge line is suddenly closed, and to run the engine at a slower speed than the first governor is set for when air is not being discharged from the tank.

The oiling system consists of pressure feed to all bearings of the engine and compressor. The pressure is furnished by a rotary pump driven by gears from the cam-shaft, and oil passes through the drilled crank-shaft to the connecting rod and main bearing. The pistons of both the engine



NEW COMPRESSOR SHOWN LOCKED FOR OVER NIGHT OR FOR TRANSPORTATION

is 6 feet 5 inches long.
and the compressor are lubricated by oil sprayed from the connecting rod bearings. The bearings of the water pump and steering knuckles on the truck are equipped with Alemite fittings. The oil reservoir in the crank-case when filled to the proper level holds six quarts of oil.

The cooling system consists of one large radiator and an air-circulating fan. From the bottom of the radiator cool water is taken and forced by the rotary pump through both the air-compressor and the engine cylinder water-jacket. Heated water is returned to the top of the radiator and cooled, and the cycle repeated.

The 92-cubic-foot compressor is mounted on a standard steel channel frame, on a special steel channel frame for Ford trucks, on a steel wheel truck or on a rubber-tired wheel truck, according to the particular service in which it is to be used. The extreme length of the standard channel frame on both steel and rubber-tired wheel trucks is 7 feet 9 inches. The mounting for Ford trucks

A New Industrial Tractor for Contracting Work

Outfit Travels at Increased Speed and Is Especially Adapted for Hauling-Work

THE uses to which the internal combustion tractor may be put in industrial, municipal, and commercial work, are indeed numerous. The International Harvester Company of America, 606 South Michigan Avenue, Chicago, Ill., is putting forth an effort in developing sales in these fields, not only of its regular 10-20 and 15-30 tractors for this type of work, but also of the new McCormick-Deering industrial tractor. The feature of the industrial tractor is its ability to travel at increased speed, which adapts it especially for hauling-work. The engine of the industrial tractor is of the 4-cylinder, valve-in-the-head, heavy-duty type and is of rugged construction with all working parts thoroughly protected from dust and dirt. Each cylinder is cast separately and fitted into the engine block. Hence, in case a cylinder should become scored and worn, a new one may be installed at small cost and with little loss of time. The sliding-gear transmission provides three forward speeds of 2, 4 and 10 miles an hour, and one reverse at 1,000 engine revolutions per minute.

Power for the McCormick-Deering industrial tractor is transmitted to the drive-wheel through gears that run in a bath of oil. The main frame is a one-piece casting extending from the front to the rear axle, forming a rigid, substantial foundation for the engine. Two sets of brakes are used, one being operated by a hand lever that

It's Not the Dead Weight of Motor Trucks Which Destroys the Highways---

Write For Bulletins On The Following:

Steel Road Forms
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"Lightning" Loaders

Investigation by the U. S. Bureau of Roads has shown conclusively that the destroying impact when the wheel strikes every wave or break crushes the road surface and breaks down the foundation.

That is why contractors the country over realize the vital need for the unequalled rigidity of Heltzel Forms.

That is why Heltzel Forms were used on the famous McCormick Boulevard, Chicago, the "Ideal Section" of the Lincoln Highway, the Lincoln Highway in nearly every state of its course, the Louisiana Highway, the National Pike, the Dupont Delaware road, Dixie Highway, Perry Highway, Susquehanna Trail, Florida Coast to Coast Highway, etc.

That is why Heltzel Forms are used by so many state highway departments —New York, Pennsylvania, Ohio, Virginia, North Carolina, Illinois, etc.

Examine that picture above with another length of road rail added and that absolutely unyielding reinforcing joint in position, and your own eyesight will tell you that a more rigid road form cannot be made out of 3/16-inch steel plate.

See Distributors' Section in back of this publication for name of nearest Heltzel representative.

THE HELTZEL STEEL FORM & IRON CO.
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works on the counter-shaft, and the other, of the internal expanding type and located on the rear wheel, being operated by foot pedals. Disc wheels are used, both front and rear. The rear wheels are equipped with 40 x 5-inch all-weather tread, solid rubber tires. The front wheel tires are 27 inches in diameter by 3½ inches wide, with plain treads. The rear wheels are so made that dual tire equipment may be added if desired. The dual tire is 5 inches wide and is mounted on a disc wheel which is firmly bolted to the regular disc wheel.

Regular equipment for this tractor includes the platform comfortable spring seat, throttle governor, oil air cleaner, two sets of brakes, muffler, etc. The following special equipment may also be secured: electric headlights, generator and battery, dual tires with 5-inch base mounted on disc wheels to be bolted to the regular wheels, belt pulley attachment, power take-off attachment, and extension rims with lugs.

These tractors are adaptable for various types of equipment, including road-building machines, road maintainers, special trailers and semi-trailers, sawmills, hoists, winches, hole-boring and pole-hoisting apparatus for telephone, telegraph, and electric companies, derricks, cranes, and many other pieces of contracting equipment.

A McCORMICK-DEERING 10-20 INDUSTRIAL TRACTOR PULLING A ROAD MAINTAINER

Improvement in 20-Ton Model Gasoline Locomotive

Better Lines and New Transmission with All Working Parts Enclosed

THE new 20-ton model gasoline locomotive designed by the Davenport Locomotive Works, Davenport, Iowa, has a long, slightly tapering hood and an all-steel cab resting on a rugged, well-designed underframe, giving it an appearance of balance and power in keeping with the service a machine of this type renders. There are no "hangovers" from steam locomotive design. All the parts and units in this new pattern are placed with efficiency and accessibility as the most important considerations. All working parts are enclosed and protected from dirt and the weather, but the arrangement is such that inspection or adjustments can be made quickly and easily.

Roller chain transmission has been adopted, since it reduces friction and wear to a minimum, gives higher mechanical efficiency, and furnishes a semi-elastic driving medium that protects the entire mechanism from shock. The four drive wheels have steel tires and are individually driven on four short axles of large diameter riding in Timken roller bearings which take both the side thrust and the weight of the locomotive. This individual wheel drive gives very good tracking qualities. Each wheel acts independently to hold the rail under all conditions.

This new model is equipped with a self-starter, Westinghouse air brakes, and electric lighting for the headlight and cab. A powerful 6-cylinder Climax engine is used to furnish ample power.

TAPERED HOOD AND HEAVY UNDERFRAME, SEEN FROM THE FRONT

KOEHRING

Crowds Above and Beyond end of Boom!

AS the Koehring shovel digs itself down, the Koehring crowding action still permits high truck loading! Both boom and dipper are at the instant command of the levers at all times and cables are kept taut automatically.

Koehring independent "crowd" permits operator to raise dipper far out beyond and above the end of the boom. Short boom and long sticks for work in close quarters still give the Koehring long reach and high lift!

In this greater operating flexibility, together with higher speed and smoother functioning due to finger-tip ease of lever control, the Koehring is decidedly an extra capacity shovel with the reliability and service life of Koehring Heavy Duty construction.

Shovel Capacities

No. 1—¾ cu. yd. dipper, struck measure, on 19 ft. 6 in. boom with 16 ft. dipper sticks. 4 cylinder, 5"x6" gasoline engine, 1000 R. P. M.

No. 2—1½ cu. yd. dipper, struck measure, on 20 ft. 7in. boom, with 16 ft. dipper sticks. 4 cylinder, 5½"x7" gasoline engine, 1000 R. P. M.

Write for Shovel Bulletin No. S6

KOEHRING HEAVY DUTY

KOEHRING COMPANY

PAVERS, MIXERS—GASOLINE CRANES, DRAGLINES AND SHOVELS

MILWAUKEE, WISCONSIN

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THEW CRANE EXCAVATOR WITH CLAM-SHELL

An Out-of-the-Ordinary Sewer Job

Haddad & Kairal Use Gasoline Clam-Shell Successfully on Job Where Other Contractors Failed

A SEWER job is ordinarily considered a commonplace contract, but this was not the case with the one now nearing completion for the city of Lima, Ohio, which is being successfully handled by Haddad & Kairal, contractors, of Lima, with James A. Black as General Superintendent. The difficult nature of the contract is shown by the fact that two other contractors gave up after starting it. The job is known as Contract B, Intercepting and Outfall Sewer, and is the intercepting sewer for the entire city of Lima. It follows the Ottawa River from the east to the west side of the town and includes three tunnels under the main line railroad.

Practically all of the earth was found to be filled ground upon a base of solid limestone rock. About three-quarters of all trenches had from 6 inches to 10 feet of limestone rock in the bottom. It was also below water-level, which made the water problem a difficult one to meet. In addition, the sewage disposal plant has not yet been built, thus leaving the job without a water outlet. This, with the fact that all connecting sewers had to be taken care of, makes the job one of unusual difficulty.

All excavation is being done with a Thew 1-yard steam shovel and a ¾-yard Thew gasoline clam-shell. The earth is stripped off with the shovel, and the clam-shell cleans up the blasted rock. The trenches are tight-sheeted, and over 200,000 B.M. feet of lumber has been left in place so far. Mr. Black, the general superintendent, states that there have been no delays due to the breaking down of either of the machines, which indicates how well the job was planned, and also the quality of the equipment.

Three Ingersoll-Rand portable air-compressors, seven Domestic gasoline-driven pumps, five Jackhamer drills, three spade hammers, and a blacksmith shop to keep the tools in order, have been going most of the time. Over 35,000 cubic yards of earth and 6,000 cubic yards of rock have been removed thus far. Over 3,000 cubic yards of Class A concrete has been used in the retaining walls, and 600 linear feet of the 36-inch block sewer was in 10 feet of limestone rock. This was placed with a 5- x 5-foot tunnel and backfilled with crushed stone. The work was started April 15, 1924, and is now near completion.

THEW STEAM SHOVEL ON LIMA, OHIO, SEWER JOB

KEEP THE MIXER GOING!

But to do it you must have a truck that doesn't ask for time out, that will keep going at high speed over rough roads without a whimper, and that can stand this pace day after day until the job is done.

The United "Constructor" is that kind of a truck. It is designed and built for road contractors' work only. Every unit in its construction was selected with this type of service in mind.

Most remarkable records for dependability and economy on the job have been made by United "Constructors." Let us tell you of some of them.

The "Constructor" is built for one job, sold for one job and serviced on the United's exclusive "Instantaneous Service Plan."

UNITED MOTORS PRODUCTS COMPANY

"Quality Transportation Units Since 1910."

Grand Rapids, Michigan

Continuous Stirrups of Wire Mesh for Reinforced Concrete Beams

New Method Has Economical Features

REINFORCED concrete construction calls for the assembling of steel bars taking tensile, compression, and shearing stresses, so as to have them retain positions in the structure, after the concrete has been poured, exactly in accordance with the designer's calculations.

Numerous attempts have been made in times past to construct complete reinforcing units by rolling special sections having shear members branching from the main section serving as the tension and compression member; or by welding, or otherwise fastening, the different reinforcing members together in the positions they were designed to occupy inside the concrete mass. The method of wiring the different members together after they are placed in the forms is the one in almost universal use to-day.

This method was adopted because of the fact that completely assembled units delivered on the job were generally too bulky or heavy to place in the forms by hand, and power-operated hoists or cranes are not usually available or convenient to operate where light form work only is in position in the structure.

When the theory of continuous beams is used in the design of concrete, it becomes necessary to run certain of the reinforcing bars past supporting columns and into adjoining beams to take care of negative bending moments, and this makes it difficult, if not impossible, to assemble the reinforcing before placing it in the forms.

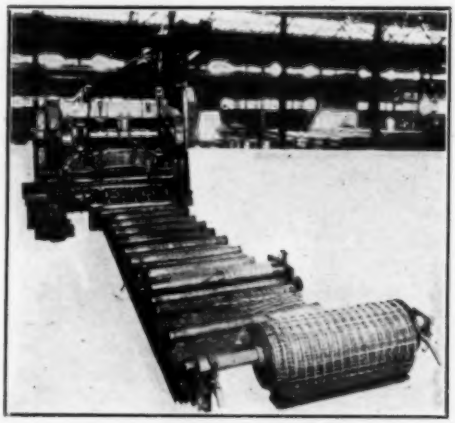
In addition to the objections cited, it is apparent that any derangement or distortion in handling a completely assembled unit will prevent it from takng a proper position in the forms and insuring the concrete's being poured without voids and so as to properly encase and protect the metal.

Placing individual pieces of reinforcing in the forms and then fastening them together in their proper locations is a laborious and many times a difficult undertaking, especially when the beam is deep and the assembling and tying is complicated by overlapping bars from adjoining beams. Sometimes it becomes necessary for the workmen to lie flat on the forms and grope with arms extended their full length when wiring together the pieces at the bottom of the beam.

In placing shear bars, or stirrups, in the positions called for by a design, it is necessary, when these are individual bars, to wire them to the main reinforcing near the bottom of the beam and also to hold them in proper alignment by securing them to main reinforcement near the top of the beam, when possible, or to provide special longitudinal supporting bars which extend under the hooked ends of the stirrups and to which each stirrup is securely fastened by wiring.

This construction has suggested to many the idea of fastening all the stirrups required for one end of a beam together by welding, or otherwise

ROLLED SECTION WITH SHEAR MEMBERS CUT AND BENT UP



STRAIGHTENING-ROLLS AND SHEARING DEVICE FOR CONTINUOUS REINFORCEMENT FOR BEAMS

attaching longitudinal bars or wires to all. Continuous stirrups have also been made by modifications of the processes used in forming spiral reinforcement for columns, but these methods are objectionable either because of high cost of manufacture, or because of superfluous material, or, in the last case, because of the difficulty of holding the material in its proper position without almost as much tying as where individual stirrups are used or, if run across the top of the beam, making it necessary to raise the main reinforcement and slip the continuous stirrup over the ends of the bars, a highly impractical operation.

After careful study of all the difficulties encountered in either shop or field assembly of beam reinforcing, Joseph T. Ryerson & Son, Inc., Chicago, Ill., has brought out a continuous stirrup which has reduced the field labor to a minimum.

This type of continuous stirrup is made from

UNIT FRAME WITH ALL MEMBERS TIED BEFORE PLACING IN FORM

rectangular wire mesh which is furnished in rolls by the wire mills. The material is run through straightening rolls and then cut into sheets of sufficient width to include the two sides and bottom of the stirrup to be formed, as well as the additional material required to form hooks at each side of the beam. The shearing is done so accurately that the ends of the hooks after bending are in exact alignment and rest evenly on the wood forms at either side of the beam when placed in position in the field.

After shearing, the sheets are run through a

For Heating and Applying under Pressure all varieties of Bituminous Materials, Hot or Cold, for Road Construction, Maintenance of Dust Laying.

Heat and volume under instant control of operator. Positive pressure produced by the Kinney Pump.

Auto Heater and Distributor PATENT COMBINATION

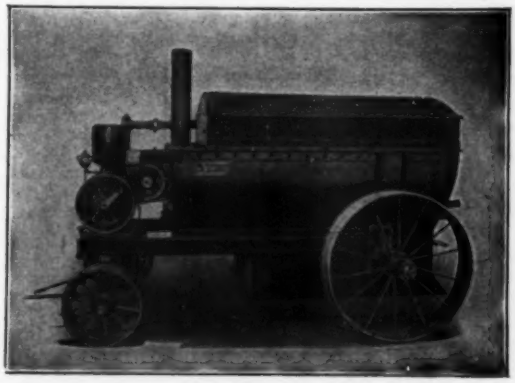
QUALITY Kinney EFFICIENCY

HANDY HEATER and SPRAYER

Especially adapted for Road maintenance, construction and general repair work. Contents constantly agitated while heating.

No burning or coking of materials, Pump, Piping, Hose, Nozzles, AutomaticallyHeated.

No Steam Required.



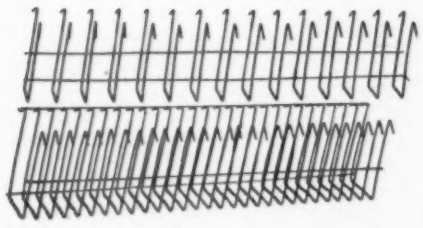
Kinney Manufacturing Company

3529 Washington Street

BOSTON, MASSACHUSETTS

BRANCHES:

NEW YORK PHILADELPHIA CHICAGO SAN FRANCISCO HOUSTON KANSAS CITY



CONTINUOUS STIRRUPS MADE FROM ELECTRICALLY WELDED FABRIC

In the upper piece the main wires are spaced 4 inches apart, and in the lower, 2 inches apart

specially designed machine operated by compressed air. The hooks are first bent at the edges of the sheet; a plate the exact inside width of the stirrup to be formed is then inserted in the machine, and the sides and bottom of the stirrup are pressed to the desired depth and width with all corners straight and true.

When delivered at the building, it is only necessary to drop the stirrups into position in the form, then insert the main reinforcement and wire these bars onto the stirrups in two or three convenient places, and the beam is ready for the pouring of the concrete.

The stirrups support the main reinforcement at the proper height above the forms, and no other supports are required except in the case of long beams, where the usual bar supports may be needed at the center of the beam. In any case, two-thirds of the lower beam bar supports usually furnished can be dispensed with, and in many cases they will not be needed at all.

The omission of these supports is a considerable saving in cost, but the principal economy is in the great reduction in field work, which has been fully explained, and is apparent to any one who has had experience in the placing of reinforcing steel.

A comparison of the cost of the material used in shear reinforcement, consisting of individual stirrups and their equivalent in continuous stirrups made from rectangular wire mesh, factory-welded, is shown by the table. For any other sizes of beams the comparison would be similar.

It will be seen from this table that the cost of continuous stirrups made from rectangular wire mesh is higher than the cost of individual stirrups when delivered ready for use, but the increase in first cost is insignificant when the ease of setting, the tremendous reduction in field labor, and the saving by the omission of the usual bar supports are taken into consideration.

Rectangular wire mesh is usually made with the main and secondary wires each uniformly spaced, although the spacing may not be, and generally is not, the same for both wires. Where the number of stirrups required are few, or there are a large number of different sizes or shapes, and but few of each kind, standard mesh having a spacing and size of main wires equivalent to the size and minimum spacing of individual stirrups is used, but where the quantity of any one size is large, wire mesh can be furnished having the main wires spaced close together, at one edge of the roll, and with the spacing increased toward the other edge, providing a mesh equivalent in every way to that called for in a design having individual stirrups shown or specified.

The comparative tables given are based on mesh having main wires of the same size, number, and spacing as individual stirrups after they are assembled in the forms.

In the new Palmer House being constructed in Chicago, about 33,000 wire mesh continuous stirrups are being furnished by Joseph T. Ryerson & Son, Inc. Most are being used as shear reinforcement for concrete beams, while in some cases they are used as wrapping for steel beams, for which purpose they are readily adapted.

The uniformity of wire spacing, exact width, straight sides, and ease of application where concrete protection for the steel beams at sides as well as underneath is a prime requisite, give this type of beam wrapping many advantages over any other kind.

Architects, engineers, and contractors who have used poultry netting for beam wrapping and have struggled with the buckling of the material or a sinking feeling that perhaps some of the concrete aggregate will stick in the netting and prevent a perfect flow of the concrete, causing inadequate protection for the steel, will appreciate the advantages of this new product.

It can be shaped to fit any requirement and cut from rolls up to 10 feet wide in special cases.

Beam Size in Inches	Number Stirrups per Beam	Size of Wire or Rod in Inches	When ⅝" Supporting Bars are Used			When Supporting Bars are Not Used		
			Weight in Lbs.		*Cost of Wire Mesh over Individual Stirrups and Bars %	Weight in Lbs.		*Cost of Wire Mesh Over Individual Stirrups %
			Individual Stirrups and Supporting Bars	Wire Mesh Continuous Stirrup		Individual Stirrups	Wire Mesh Continuous Stirrup	
10x16	5	¼	4.663	3.223	.....	2.783	3.223	39.2
	6	5/16	7.600	5.687	.....	5.219	5.687	24.5
	7	⅜	11.529	9.329	1.0	8.772	9.329	23.5
	8	7/16	17.510	14.416	6.2	13.625	14.416	28.5
	9	½	23.923	20.945	7.0	20.038	20.945	22.5
	10	⅝	37.301	29.366	8.0	28.164	29.366	23.5
12x20	5	¼	5.356	3.918	.....	3.478	3.918	28.1
	6	5/16	8.904	6.992	.....	6.523	6.992	16.9
	7	⅜	13.721	11.521	.....	10.964	11.521	18.0
	8	7/16	20.915	17.945	5.0	17.036	17.945	23.0
	9	½	28.930	25.954	6.2	25.049	25.954	19.0
	10	⅝	40.341	36.403	7.5	35.202	36.403	19.8

*Comparison of cost takes into consideration only the actual cost of the material in the case of individual stirrups, but the complete cost of the fabricated wire mesh stirrup. The slight difference in first cost is negligible compared to the saving in labor costs at the job and the saving in time.

CITY OF NEW HAVEN, MO.
OFFICE OF THE MAYOR
OTTO BUCHHOLTZ, MAYOR

New Haven, Mo.
March 5, 1923.

Standard Oil Co. (Indiana),
Chicago, Illinois.

Gentlemen:

For many years we had difficulty in keeping our streets smooth with our small finances - until oiling the streets came to our rescue.

We purchased costly machinery for this work and found that in two years the oiling saved us enough money on our streets to pay for the machinery.

We used your No. 5 Standard Asphalt Road Oil. It put an end to the washing of our streets, by building up a smooth asphalt coating on them. It will effect a still greater saving for us in the future.

Yours respectfully,

(Signed) Otto Buchholtz, Mayor.

These photographs of streets in Washington and New Haven, Mo., have not been retouched. They show distinctly what excellent streets may be had by using Standard Asphalt Road Oil. No. 5 grade is used in these two towns.

CITY OF WASHINGTON
POPULATION 5000
JOHN J. ERNST, MAYOR

Washington, Mo.,
March 20, 1923.

Standard Oil Co. (Indiana),
Chicago, Illinois.

Gentlemen:

For the past 12 years, the City of Washington, Mo., has used your No. 5 Road Oil on its streets and this grade has proved very satisfactory.

We have always found this grade of oil uniform in quality and complying strictly with your specifications, which we have proven by numerous analyses that have been made.

Since using your No. 5 road oil our maintenance and repair costs have been practically nothing. Our streets today have a coating that looks and wears like sheet asphalt and the oil has penetrated to a depth of from 3 to 5 inches.

Strangers and visitors compliment us on the good condition of our streets and it is hard for some to believe that this was brought about by the use of road oil only.

We oil twice a year. The first application is put down about the 15th. of May and the second the first part of September, using about 50,000 gallons on approximately 12 miles of streets. Both applications are treated with a liberal sprinkling of coarse sharp sand.

Yours truly,

(Signed) John J. Ernst, Mayor.

Are They Oiled *or* Paved?

HERE is photographic proof of the truth of our often repeated statement that Standard Asphalt Road Oil, properly used, builds up a wearing course or carpet which closely resembles sheet asphalt, both in looks and wearing qualities. Look carefully at these unretouched photographs and read the letters written by Mayors Ernst and Buchholtz.

For twelve years, Washington, Mo., has spent practically nothing for street repairs. Each year, the city uses five or six tank cars of No. 5 Standard Asphalt Road Oil on its streets and as a result it has twelve miles of most excellent streets.

Standard Asphalt Road Oil

solved the street paving problem for New Haven, Mo., and in the first two years effected a sufficient saving to pay for the costly equipment which the street department of that city purchased.

Many other towns and cities have had experiences similar to that which Mayor Buchholtz mentions, for as he points out, our oils not only prevent the washing away of streets, but builds up on them a smooth, protecting asphalt coating.

In view of the great demand for these road oils, it is advisable for city and county engineers and commissioners to place their orders at once.

The services of our staff of road engineers are always at your disposal. This service, which is free, is of inestimable value. We invite you to avail yourself of it.

STANDARD OIL COMPANY
(INDIANA)
904 S. Michigan Avenue Chicago, Illinois

Increasing the Attractiveness of a Concrete Arch Bridge

Improved Construction Methods and Resurfacing Increase Esthetic Value of Structure

THE Crystal Falls Bridge over Paint River, Mich., is said to be the largest concrete arch bridge in Michigan. It was erected for the Michigan State Highway Department by Smith-Holmes-Burridge-Sparks, general contractors. This structure is a fine illustration of the forward strides being made in highway bridge building practice, since the economy of building for strength and permanence has been realized.

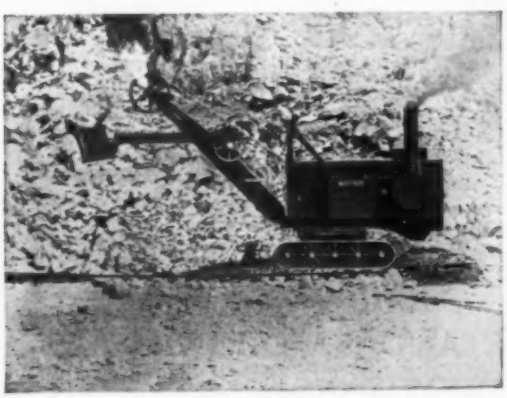
THE COMPLETED CONCRETE ARCH BRIDGE AT CRYSTAL FALLS, MICH.

The most modern and approved methods of construction were employed in this attractive structure. Unusually careful attention was paid to details of appearance, both in the design and in the finish, and this has resulted in a combination of pleasing appearance and rugged strength. The smooth surfacing of the bridge was largely accomplished by the use of the Berg concrete surfacer and finisher, made by the Concrete Surfacing Machinery Company, Department F, 4669 Spring Grove Avenue, Cincinnati, Ohio. This surfacer is a small, portable machine operated on direct or alternating current, which displaces the slow, expensive hand methods of smoothing and surfacing concrete structures to increase their attractiveness and service.

A New Quarry Shovel with Crawler Tread

Four-Yard Full-Revolving Shovel for Steam or Electric Operation

A NEW shovel known as the 120-B has recently been announced by the Bucyrus Company, South Milwaukee, Wis. This shovel is fundamentally different from anything yet placed on the market. The Bucyrus Company realized that the first cost of the shovel is of minor importance as compared to low maintenance cost, especially for severe service, such as in quarries and other work where extremely hard digging conditions are encountered. This 4-yard full-revolving shovel combines the rugged strength, power and speed of the railroad type shovel with the greater mobility and the full-circle swing of the revolving shovel. It has crawler traction and may be operated by steam or electricity.



FOUR-YARD FULL-REVOLVING STEAM SHOVEL ON QUARRY WORK

The shovel is built with the close-coupled strength, sturdiness, and digging power usually found only in the railroad type shovel. For example, the boom is about the same length as that on a 115-ton railroad type shovel, and at the same time its shafts are designed with from 30 to 50 per cent greater strength than heretofore used in conservative designs. The base and the revolving frame are of solid casting construction without structural work, rivets, or bolts. It contains refinement of design, such as superheater equipment, a fire-brick arch in the boiler, and brass shell bearings, which have never before been offered as standard equipment.

The grate area of the boiler is 10 per cent more, and the heating surface 15 per cent greater, than in the most powerful railroad type shovel. With the superheater equipment, the boiler efficiency is further increased by the reduction of water and coal consumption by 20 to 30 per cent. It is said to be the largest shovel that has yet been mounted on crawler traction.

P & H Move Pittsburgh Offices

THE Harnischfeger Corporation, formerly Pawling & Harnischfeger Company, Milwaukee, Wis., has announced the removal of its Pittsburgh sales office from 57 Fidelity Building to 612 Farmers Bank Building, Fifth Avenue and Wood Street, Pittsburgh, Pa. A. J. Dreyer is District Manager and M. B. Bradley is Sales Engineer at the Pittsburgh office.

Kyrock—the Stitch in Time Which Saves Your Old Streets

THE time to repair a pavement is when the break first occurs. Moisture beneath the surface and the multiplied impact of heavy traffic on broken areas cause rapid disintegration. A repair which could be made for a dollar today will cost many times as much if the work is delayed. Extended neglect may call for new surface or complete new construction.

Kyrock encourages prompt and efficient maintenance of pavements because it is shipped ready to lay without mixing, heating or other preparation. It may be stored in the open and used as needed.

Kyrock is most economical because of the simplicity of laying and the small equipment required for patching—shovel, rake and tamp. Kyrock patches bond and usually outwear the surrounding old surface.

Extensively used by states, counties and cities for patching and re-surfacing old gravel, macadam, telford, brick, concrete and asphalt roadways. Because of its fine sand aggregate, Kyrock is peculiarly adapted for feather edge patches on brick and concrete.

Specifications for patching and re-surfacing all standard types of pavements will be sent to engineers, road and street officials. Write for literature on Kyrock maintenance, Booklet C.E.M.

Kentucky Rock Asphalt Co.
Incorporated
Monarl E. Taylor Bldg. Louisville, Ky.

Crawling Tractor Crane Has Many New Features

Developments Include Split Gears for Propelling, Increased Speed, and Unusually Long Tractor Belts

A LOCOMOTIVE crane is not a tool adapted for use in a few industries. It is a labor-saving device which is far more versatile and which has a much greater field of usefulness than almost any other material-handling machine. While it is of particular value and service in the contracting field, it is also a necessity for railroads, ship-building plants, iron and steel industries, coal yards, foundries, and in practically all manufacturing plants. Crawling tractor cranes have been developed to extend the usefulness of the locomotive cranes beyond the limitation of rails.

Industrial Works, Bay City, Mich., has recently announced a new improved 10-ton crawling tractor crane, known as its Type-DC. While this crawler crane is very simple in outward appearance in comparison with the former types of tractor cranes made by that company, its design embodies a number of new engineering features, such as split gears for propelling, increased speed, double clutch mechanism, unusually long tractor belt, independent functions, etc.

THE NEW INDUSTRIAL WORKS MODEL DC CRANE IN ACTION

The manufacturer claims that the most important of the new features is the system of split gears by which each tractor belt is separately controlled. Two concentric vertical propelling shafts at the axis of revolution lead two independent but concentric trains of spur and bevel gears, each operating one tractor belt. Each belt is directly controlled by two powerful friction clutches and brakes in the revolving upper works, which gives absolutely independent, definite, and easy control over each belt while propelling. This is an all-gear drive from engine to sprocket, with no chains in the mechanism whatsoever. Industrial Works states that this Type-DC is the only crawler crane that steers and propels by friction clutches, and the only crane that has a friction clutch and band brake for each tractor belt. These features make maneuvering in close quarters comparatively simple.

All speeds of the motor-operated crane have been increased 25 per cent, which provides ample speed for the fastest possible handling of all materials. The double clutch mechanism by which the two slewing band clutches are operated by one lever, makes for very simple slewing. The direction of slewing is changed at will by the movement of the slewing double clutch lever. No reversal of the engine is necessary.

The crawling tractor belts are of sufficient length to give plenty of stability when lifting over either end on any kind of ground. The center distance between the two end sprockets of this new machine is 10 feet.

All functions of this crane are absolutely independent of each other. Separate levers actuating each function are conveniently placed on the operator's platform in the revolving upper works. Different combinations of these independent functions may be utilized at one time to great advantage.

The crane may be equipped to operate with a steam engine, electric motor, gasoline motor, or fuel drive engine of the diesel type to suit any operating conditions. It is very versatile, operating with clam-shell or dragline buckets, electric-magnet, hook and block, or grapple. It is readily convertible into a shovel or a pile driver. Any equipment that operates on a boom can be applied to this outfit.

CURE CONCRETE WITHOUT WATER

One Man Does It All Alone

The application of Dowflake to the surface of newly laid pavement is a simple one man job, yet it does all the curing and takes the place of moist earth or straw, ponding, water pumping and all the fuss and muss of old-fashioned curing methods.

After being applied Dowflake automatically keeps the surface wet without leaving anything to be scraped or hauled away.

Dowflake saves endless argument and inspection. It absorbs moisture from the air and holds it in intimate contact with the concrete until curing is complete.

All there is to concrete curing is a continuous supply of moisture and Dowflake provides that.

Look over the book—"How to Cure Concrete." It is full of data contractors and road men use daily. Send for your copy now.

The Dow Chemical Co.

143 Water Street

Midland Michigan

Branch Sales Offices

90 West Street, New York City

Second & Madison Sts., St. Louis

Please send me

☐ How to Cure Concrete

☐ How to Maintain Roads

Name.....

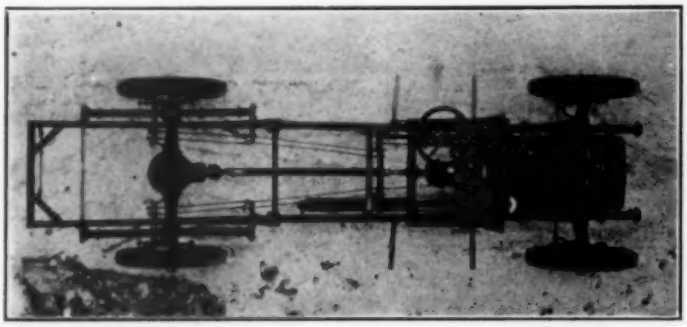
Address.....

New Model One-Ton Trucks with Four-Wheel Brakes

The Mechanically Operated Brakes Give Added Safety Feature

THE latest developments of the automotive industry, including four-wheel brakes, are incorporated in the new model one-ton truck which has recently been announced by the General Motors Truck Company, Pontiac, Mich. This truck represents radical improvements in motor truck design and is the first to be produced with four-wheel brakes, which is considered an added safety feature in commercial vehicles. The brakes are mechanically operated and have been tested under all road and load conditions.

Greater attention than is usually the case is paid to the comfort of the truck operator. This has necessitated the rearrangement of the steering wheel and brake and clutch pedals into positions that will afford the driver ease of operation and position equal to that of a passenger car. In addition, controls, switches, and fuses are concentrated within easy reach of the driver.



BIRD'S-EYE VIEW OF STRIPPED CHASSIS OF NEW GMC TRUCK WITH FOUR-WHEEL BRAKES

Mechanical improvements have been added to the speed, horse-power, and rideability of the new truck, which has the standard GMC features, such as removable cylinders and full-pressure lubrication. In addition to the mechanical features, the outward appearance has been entirely redesigned. The hood and chassis lines have been improved.

The engine has 239 cubic inches displacement, having a bore and stroke of 3 9/16 x 6 inches. It develops 37 actual horse-power, and the governed speed is 30 miles per hour. Three-point suspension is used, but with the innovation of inserting shock cushions between the engine and suspension brackets. At the front end the cushion is in the form of a ring inside the bracket, entirely surrounding the starting crank-shaft bracket. At the rear the cushions are in the form of large cushion washers, enclosed in steel stampings. These shock cushions both reduce vibration and eliminate noise.

The rear and front axles and the differential have been specially designed for the new model with a view to obtaining maximum strength and accessibility. Several changes have been made in the front axle, including inclined knuckle-pins to provide easier steering. Service brakes on both front and rear wheels are of the mechanical external contracting type. The emergency brake is internal expanding, working on the rear wheels. An equalizer distributes the pressure between the front and rear wheels. Specially designed mechanism makes the four-wheel brakes easier to operate than most truck two-wheel brakes.

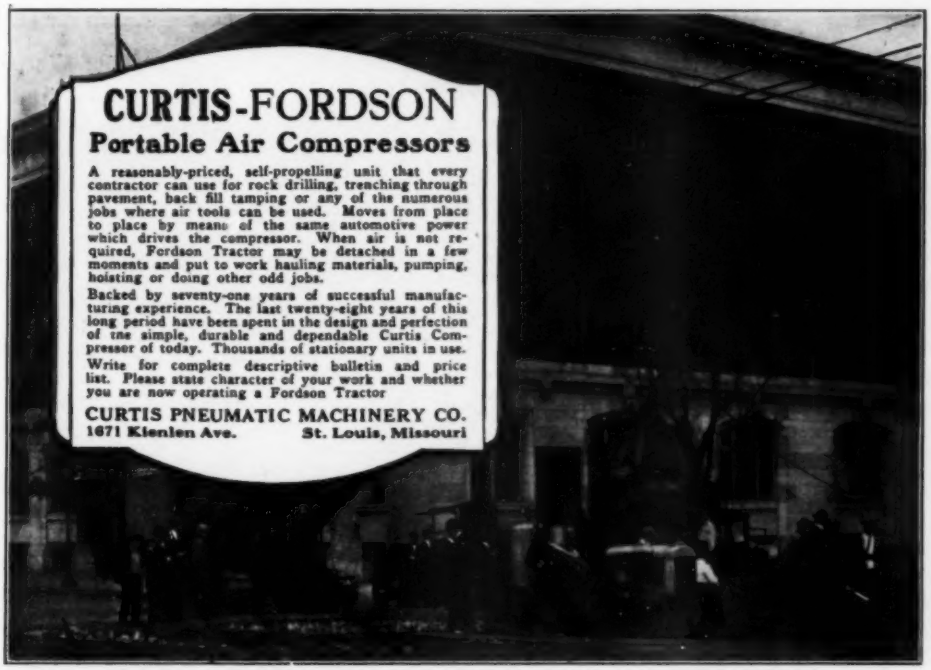
The wheel-base is 136 inches, and the standard chassis shipping weight is 3,433 pounds. The frame is of pressed steel, semi-flexible, 5½ inches deep, and 3/16-inch thick. It has four cross-members and diagonal braces at the rear. Newly designed springs materially increase the riding comfort of the truck.

A New Waterproofing Paint

Water Used as Vehicle for Stucco or Concrete Paint

A WATERPROOFING paint that can be applied directly to a wet wall, either to the interior surface of a wet basement wall, or to the outside of a stucco or concrete building, has been developed by the Master Builders Company, Cleveland, Ohio. This paint, known as Mastertex, contains no oil or other volatile elements which might deteriorate under weather conditions or from the effects of lime in the moist concrete. It is a fine, dry powder which, when mixed with water in the proper proportions, forms a paint that both waterproofs and decorates concrete, stucco, and other exposed masonry surfaces and keeps them dry and attractive indefinitely, according to the manufacturers. Its colors are said to be permanent and its indissoluble structure unites with concrete, brick, or stone and becomes a permanent part of the wall. Thus it is a permanent protection against seepage of moisture.

It is claimed that in hardening, Mastertex does not dry out to a chalky, dusty coat as do many cement mixtures that have been developed for similar work. Provision is made to prevent the evaporation of the water in new material until the solid elements have taken a hard, dust-proof set like that of the best concrete. This finish can be washed frequently and it does not wash or scrub off and does not rub off on the clothes.



CURTIS-FORDSON

Portable Air Compressors

A reasonably-priced, self-propelling unit that every contractor can use for rock drilling, trenching through pavement, back fill tamping or any of the numerous jobs where air tools can be used. Moves from place to place by means of the same automotive power which drives the compressor. When air is not required, Fordson Tractor may be detached in a few moments and put to work hauling materials, pumping, hoisting or doing other odd jobs.

Backed by seventy-one years of successful manufacturing experience. The last twenty-eight years of this long period have been spent in the design and perfection of the simple, durable and dependable Curtis Compressor of today. Thousands of stationary units in use.

Write for complete descriptive bulletin and price list. Please state character of your work and whether you are now operating a Fordson Tractor

CURTIS PNEUMATIC MACHINERY CO.
1671 Kienlen Ave. St. Louis, Missouri

Look for the Name!

OSGOOD

It is the stamp of more than 50 years of successful excavating machinery manufacture.

It insures you a time tested product; backed by a concern of long standing.

OSGOOD means long service life, ample power, efficient economical operation and a range of machines to meet your requirements.

¾-1-1¼-Yd. Revolving Steam Shovels and Combinations.

1-½ to 6-Yd. Railroad Steam Shovels on Continuous Treads, Traction Wheels or Railroad Trucks.

¾-Yd. Gas, Oil or Electric Shovels and Combinations.

THE OSGOOD COMPANY

Marion, Ohio, U. S. A.

When writing to advertisers, please mention the Contractors' & Engineers' Monthly—Thank you.

A New Small Tilting Mixer

New Unit of 3½ Cubic Feet Mixed Capacity Is a Light-Weight Handy Outfit for General Purposes

A NEW tilting mixer of 3½ cubic feet capacity has been brought out by the Ransome Concrete Machinery Company, Dunellen, N. J., under the name of the Ransome "Tilting" mixer. This well-built unit is made for contractors who wish a light-weight and handy mixer for general purposes and small jobs, and one that can also be used for mixing mortar successfully.

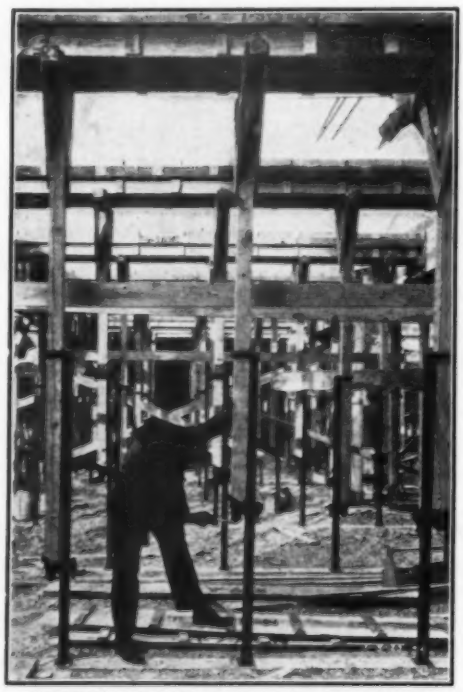
This Tilting mixer has Timken adjustable double-thrust bearings on the spindle, may be charged or discharged from either side of the machine, and has self-cleaning mixing blades with non-balling blades in the base of the drum, and the tilt of the drum is controlled by a gear and pinion with an easy locking device, so that the drum may be locked with one hand. It is built with a band iron wearing ring to take the wear occurring on the outside of the discharge and charging hole. The main frame is built up of 4-inch channels, not riveted, wide at the back to form a rigid engine base, and narrow in front so that it can be turned easily. The pedestals are of structural steel to eliminate breakage. This outfit is furnished with either a four-steel-wheel truck or a two-wheel trailer with solid rubber tires on a spring-hung axle.

THE NEW RANSOME 3½ MIXER

A New Adjustable Shore

Manufacturers Claim Material Cut in Cost of Shoring Through New Device

A NEW adjustable shore which will cut shoring costs has been placed on the market by the Symons Clamp and Manufacturing Company, 2443 North Sheffield Avenue, Chicago, Ill. The lock for the Symons adjustable shore does not depend on a clamping or gripping action and is entirely independent of the load on the shore. It can be made secure before any load comes on. The lock is so constructed that it does not creep or settle the way cams may when the load is applied.



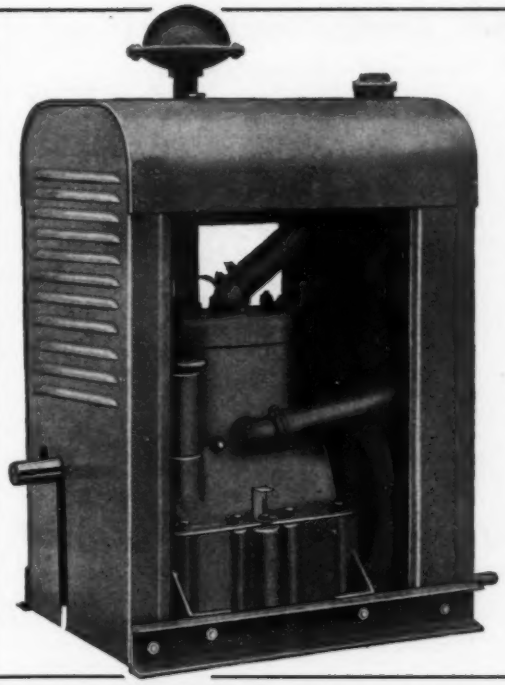
SETTING AN ADJUSTABLE SYMONS SHORE

This metal shore has an adjustment of 5 feet at 1-inch centers and has a 2½-inch secondary or final screw adjustment. It can be adjusted in an upward direction under full load, and no jack is required in making either the first or the secondary adjustment.

Tests have shown that the Symons shore will carry a load of 18,000 pounds. It is recommended, however, for a safe load of 10,000 pounds. The supporting members are high-carbon steel and malleable iron. Because of the material, there is little depreciation in the shore, a coat of paint being required only occasionally. There are no loose parts or detachable parts to become lost either in use or in shipping, and no separate tool or jack is needed to operate it. This shore complete without the 4 x 4 weighs 34 pounds, making it easy to handle, one man being able to set it up quickly. There is also the advantage that freight charges on shipments are small and the cost of trucking is greatly reduced.

Features of August Issue

Widening the Albany Street Bridge, New Brunswick, N. J.
Building the Fourteenth Street Edison Plant, New York City.
The Construction and Maintenance of Cement Concrete Pavements.
Building the Bee Line Highway, Alabama.



Increased Production

comes easily when your equipment has **ALAMO POWER.**

You can lay more miles of pavement, pour more cement, load or unload more cars. Your trucks can make more trips each day because of fewer shutdowns.

On equipment on the job, **ALAMO ENGINES** give service.

Specify **ALAMO ENGINES** on your equipment or write us direct regarding your power problems.

THE ALAMO ENGINE CO.
HILLSDALE, MICH., U. S. A.

Mack

1900 1925

for profitable Transport service

For a full quarter century Mack interests have been centered upon the manufacture of Motor Freight Carrying Vehicles and Motor Buses.

Throughout the United States, Canada and in all foreign countries where representation has been established, experienced truck and bus buyers look upon MACK as an investment that not only has a twenty-five year background, but one produced by an organization whose manufacturing and selling policy has been consistent and whose plant expansion and earnings have kept a conservative balance. In short:—To those with experience a sound investment and a MACK are one.

MACK TRUCKS, INC.
INTERNATIONAL MOTOR COMPANY
25 Broadway, New York City

Eighty-five direct MACK factory branches operate under the titles of: "MACK-INTERNATIONAL MOTOR TRUCK CORPORATION" and "MACK MOTOR TRUCK COMPANY"

MACK TRUCKS · MACK BUSES · MACK FIRE APPARATUS · MACK RAIL CARS

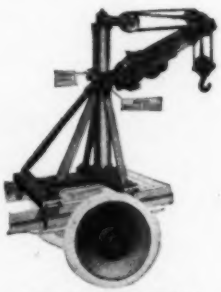
P E R F O R M A N C E C O U N T S

A Well-built Truck Derrick

Unit Effective for Unloading Gondola Cars or Trucks

A WELL-BUILT steel derrick that can be used to advantage for loading and unloading trucks, gondola cars, and other transportation units, has been developed in the Sasgen Ideal truck derrick, made by the Sasgen Derrick Company, 3101-3129 Grand Avenue and Albany, Chicago, Ill. This derrick can be placed on a platform or on the back or front end of a truck, or on a platform attached to gondola cars for unloading them. The boom swings in a full circle and can be raised and lowered to suit the work. It is easily operated by one or two men, and in many cases one man can do the work of three or four in unloading the truck and cars.

The derrick has a capacity of 2,000 pounds with a boom of 6 or 8 feet, while with the 10-foot boom the capacity is 1,500 to 1,800 pounds. With a boom 11 to 15 feet long equipped with extra braces to the top of the mast, the derrick has a capacity of 1,500 to 2,000 pounds. The derrick is equipped with a winch for load and boom, and with cable to reach 25 feet from the derrick.



THE SASGEN IDEAL TRUCK DERRICK

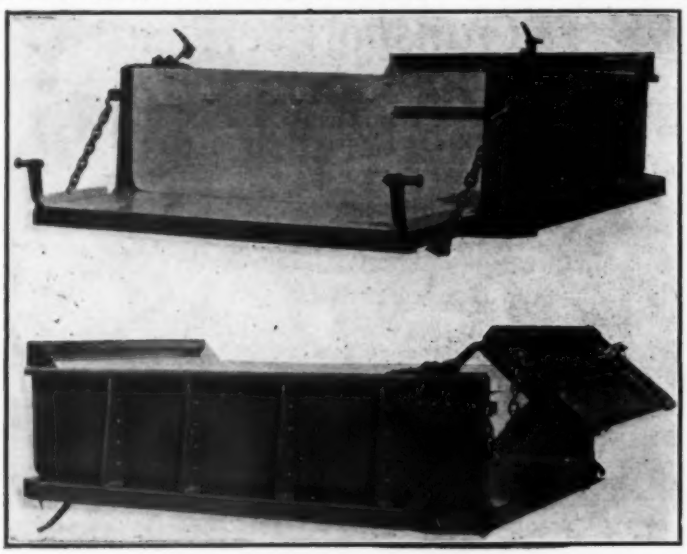
A New Truck Body with Very Strong Floor

Body Developed Specially for Chicago Conditions Has Many Features to Recommend It

EXCAVATING contractors in Chicago, as well as elsewhere, are confronted with the problem of hauling a great deal of material from the point of excavation to a dump some distance away. The dump bodies which handle stone, clay, dirt and rock must be strongly built to stand the strain of loading and unloading service. Practically all of the loading is done by a steam shovel which drops a bucket of rock and dirt weighing tons from a height of several feet into the body. To withstand such blows, a very strong floor is necessary.

The Heil Company, Milwaukee, Wis., in building its Chicago type excavating body, makes use of a wearing plate of 3/16-inch steel on top of the 3/16-inch flooring, giving a total thickness of 3/8-inch. This floor is well-supported with many cross-members to prevent it from sagging.

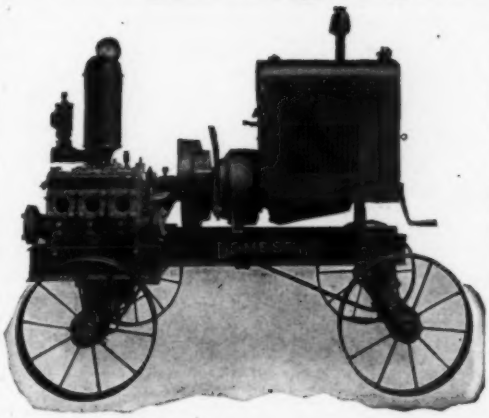
Occasionally the steam shovel operator will swing the shovel bucket around and accidentally hit the side of the body. For this reason the tops and sides must also be strong. This Chicago body has four side braces and an extended run-board with a double side angle or channel edge at the top for strengthening the side and for stiffness. At the front end of the run-board is a special steel casting so curved that it reinforces and protects the front end of the body in case of a collision.



HEIL BODY BUILT TO STAND UNUSUALLY HARD KNOCKS

THE ROAD BUILDERS' PUMP

is the DOMESTIC High Pressure Triplex Unit



Your log reveals the fact that failure of your water supply means very costly delays when building hard surface roads.

It also reveals the astonishing fact that the very best Pumping Plant made, namely, the "DOMESTIC" 15-E Triplex Pump Unit, is in comparison with the importance of the duty it performs, the lowest priced piece of equipment used on your job.

Those who have thus analyzed their log records of costs and causes of delays decide to no longer use makeshift pumping equipment but resolve to use "DOMESTIC" TRIPLEX UNITS.

Write for bulletin "FC"

DOMESTIC ENGINE & PUMP CO.

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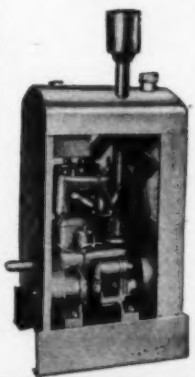
Turmo Industrial Power Plants

Built in 4 sizes, 8, 15, 25 and 35 H. P.

There are many advantages to Manufacturers and Contractors in having their entire line equipped with one make of engine.

The "TURMO" is built to stand hard, continuous usage. It has several distinctive features that are worth your consideration.



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TURMO ENGINE
TURNER & MOORE MFG. CO

On the inside of the body are stake pockets, so that sides can be added.

The body must be particularly strong when dumping a load, because of the fact that the tail-gates are frequently opened from the top and the load dumped across the gate. This method of dumping carries the load further away from the rear wheels and over the edge of an embankment or precipice.

The Heil body illustrated has a suspended chain of ⅝-inch links, a heavy ½-inch bar is riveted to the side of the body, and a clevis allows for easy adjustment of the gates. The tail-gate is reinforced with angle iron 3 x 3 x ⅜-inch to secure strength. The hinging point is set back 8 inches from the rear end, allowing the tail-gate to open more rapidly and more widely so that the load can be dumped easily. The tail-gate operating mechanism is controlled by a handle located under the body run-board, easily accessible from the cab. The rods themselves are protected by the extended run-board so that they cannot be damaged. The rear end of the body is so designed that it cannot spread under load. Gusset-plates and bumpers give it additional strength.

Across the front of the body and across the middle of the tail-gate are placed 4 x 4 x ⅜-inch T-irons to give stiffness.

Wire Guard Fence Proves Its Value

Fatalities Reduced in Automobile Accidents

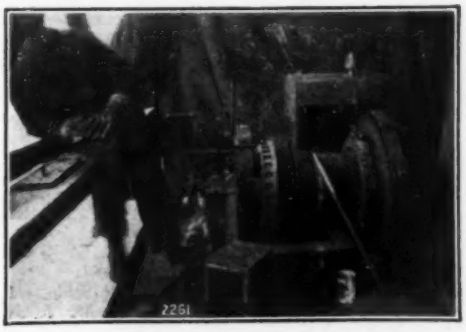
A HIGHWAY safety guard which applies the principle of the aerial life-net to prevent embankment, bridge, and curve accidents, which cost the lives of hundreds of motorists annually, has been developed by the Page Steel and Wire Company, 215 North Michigan Avenue, Chicago, Ill. This fencing is a ribbon of woven wire so fabricated as to absorb impact. It is designed to replace wooden rails, stone walls, and cables along highway danger points. Placed at the top of cliffs and curves and at bridge approaches and sides, it checks skidding and speeding machines that hit it, by the stretch of its fabric without destructive impact and without the ordinary serious damage to the car or injury to occupants.

The Highway Guard is built under a method of fabricating wire which gives maximum strength, elasticity, and recoil. Machines hitting it at a moderate speed are brought to a stop, the recoil bringing them back from danger. With the machine going at high speed, the meshes, giving uniformly, simply wrap around the hood, allowing the blow to spend itself evenly on the wheels, bumper, hood, etc., even though the blow may displace a post. In such a case the fastenings farther away hold and the car is stopped before any serious damage is done.

This guard can be installed in continuous lengths for any distance, and if one section is caused to sag by a blow, that section can be replaced. Sections on either side of the damaged portion are not affected. The guard is galvanized and painted white, making it easily visible at night. It is constructed of 24-inch wire-link fabric. The mesh formed by the No. 6 wire is square, measuring 2 x 2 inches.

INSTALLATION OF WIRE GUARD FENCE ON CURVE NEAR DETROIT

LIDGERWOOD



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Rope Pull—2,500 lbs.
Speed—150 f.p.m.
Drum—10 in. dia., 18 in.
Face Flanges—20 in. dia.

A strong, handy hoist. Easily moved. Always ready for work.

A profit maker for every Contractor.

Hoist illustrated is operating a small shaft in excavation work.

HOISTS—CABLEWAYS—DERRICKS

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A product that maintains its popularity with succeeding generations of users must have deep-rooted quality characteristics.

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That has always been the dominating idea behind Ames manufacture.

One hundred and fifty years of *"knowing how"* is responsible for the present advantages of Ames Shovels.

Their excellence of manufacture, quality of materials, and rugged strength assure a length of life that means real economy in shovel equipment for your business,—in fact wherever men work with shovels.

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Machine Finishing Gives Stronger Concrete

Increased Durability and Saving in Man-Power and Cost Are Effected

THE Ord concrete road finisher, which consists of two mechanically operated screeds without a tamper, has several advantages of interest to contractors. The manufacturers, A. W. French & Company, 8440 Lowe Avenue, Chicago, Ill., claim that the Ord gives maximum compactness or density to concrete without tamping, first, because less cement mortar is brought to the surface and consequently the surface of the road is harder and more durable. Second, fewer of the impurities, such as clay and other inerts, are worked upward to break down the wearing properties of the surface. These impurities find a way into practically every mix. The percentage is so small, however, that the impurities do no material harm when they are evenly distributed throughout the concrete, but when the inert light-weight material is worked upward and when it is concentrated on or near the surface, it becomes a menace to the durability of the road. Third, because there is less vibration with the Ord, and consequently smoother roads.

The Ord concrete road finisher has only two working members, the front and rear screeds. The rest of the outfit is designed solely to make these screeds function properly, when going forward and striking off, and for raising and carrying them clear of the concrete when backing up prior to going over the surface a second time. The carriage across the road is of rigid steel construction, heavy enough to carry the engine and other machinery without vibration, and to make the truck wheels grip the side forms, on which they run with a strong enough hold to permit striking off a large amount of concrete in front.

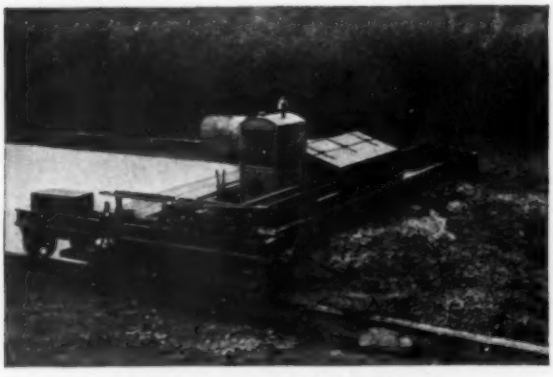
The carriage runs on six wheels, three on each side, to distribute the load evenly on the forms. Four of the wheels are driven by traction gears and chains, each pair of the traction wheels being on a small hinged truck so that each wheel always bears evenly on the forms and the load is not shifted from one wheel to another. The two rear wheels, besides carrying their share of the load, serve as steering wheels and keep the carriage square without skewing on the forms. A squaring device, however, is provided, as it is of special service when rounding curves, so that the end of the machine on the inside of the curve may be retarded while the outer end travels the greater distance. A platform for the operator is adjacent to the engine. He rides the machine while it is working, and all operating levers are convenient to his hand while he is on the platform. There are only six levers. Two of these are for raising and lowering the screeds independently of each other, two other levers are for operating the friction clutches, and the remaining two levers control the squaring devices at each end of the machine and also act independently of each other. There are, of course, the usual speed and gasoline controls on the machine, with which every operator of gasoline engines is familiar.

Three friction clutches are provided, one each for the forward and rear action drives and one to disengage the screeds when they are not working on the concrete. The two traction clutches are opposed to each other, and either one or the other is engaged by the operator through a single lever. All gears are cast iron with extra large teeth and wide faces. All the gears revolving faster than 25 r.p.m. have machine-cut teeth, while the few slow-turning gears are cast smooth and true from finished metal patterns.

The shafting is all extra-heavy, carried in strong, well-babbitted bearing boxes. The latter are of the split type with quickly removable caps.

Only two spreaders are generally used. The function of these laborers is merely to break down the concrete piles as delivered from the mixer in a very rough manner. They are used mostly for spading concrete next to the side forms and to prevent concrete from wasting over the forms as the machine is advancing. A third man is sometimes used to swing the mixer boom and to help break down the concrete when it is extra stiff or the daily output is very large, say over 600 feet of 18-foot road.

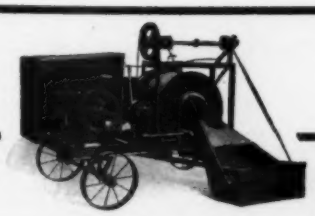
A bridge of two 2 x 10-inch planks strongly trussed is carried across the rear of the machine and is a great convenience for the paving crew on all jobs. An Alemite lubricating system is furnished throughout, and a grease gun for it goes with each machine.



AN ORD CONCRETE ROAD FINISHER

It is of interest to note that this machine will work as well with stiff concrete as with softer mixes. On one job, concrete was hauled from the central mixing plant for 7 miles, and it was then held in the trucks waiting for form setters to get ahead, so that the total time between discharge from the mixer and the start of finishing was nearly three hours. The finishing, however, was handled satisfactorily by this machine. On steep grades stiff mixes are necessary, but it is claimed that this machine leaves no rolls or ridges. These machines have surfaced over 1,000 feet of roads per day. They can keep well up with 21-E paving mixers, and on most jobs have frequently had to wait for concrete.

The "Panama" Line



Time, Labor and Money Saving Concrete Mixers

From the large batch mixer with side loader or platform, down to the small hand power mixer there is a quality Panama Concrete Mixer that will efficiently meet your needs. In time, labor and money the Panama more than saves its cost in a short time.

Panama Mixers assure a more uniform mix and a greater days work with less labor. Write for the "Panama" catalog and let us give you further details on these high quality mixers, also on Panama Concrete Block Making Machinery.

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Established 21 Years

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Wood Hydraulic Hoists have contributed to the success of the municipally-owned street railway system of Detroit. They were chosen by the city for their astonishing power, the ease with which they can be handled, and their simple construction which is responsible for long life and low maintenance. Write for the Wood Hydraulic Hoist and Body catalog before ordering your next dumping equipment and find out why Wood equipment is first choice of municipalities.

WOOD DETROIT

Hydraulic Hoists

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World's Largest Makers of Hydraulic Hoists and Steel Dump Bodies

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The Everhot tool can be used any time—any place. Its self-contained torch keeps the brand hot, thus permitting continuous use. The fuel is ordinary gasoline.

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MAYWOOD, ILLINOIS

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Ask Any Contractor or Engineer Who Has Used One.

FOR FULL INFORMATION ADDRESS

A. W. French & Company

Manufacturers The O R D Concrete Road Finisher
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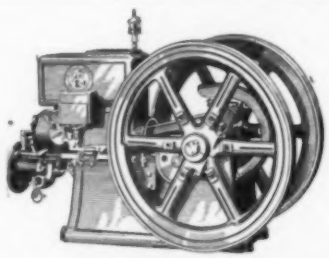

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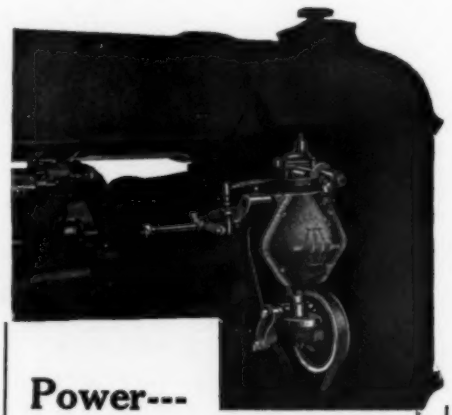

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Tropic

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These two meters, embody exactly the same mechanical features, the only difference being the changes necessary to provide a frost-breaking feature in the Arctic.

Either of these meters will be equipped with a COMPLETELY ENCLOSED intermediate train RUNNING IN OIL, if desired.

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Good references and reasonable salary to start.

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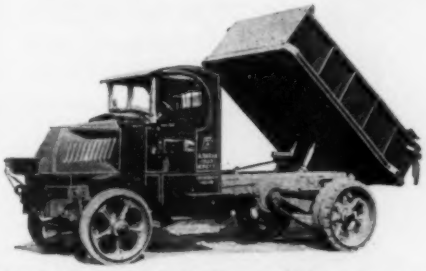

Heil Steel Dump Body Model 31 mounted with a No. 6 Heil Hydro Hoist on a 5-ton Mack. The Body is 9 ft. 9 in. long, 6 ft. 6 in. tapered in width, and 26 in. high.

The Hoist Counts

IT'S the hoist that counts. A dump truck is just as good as its hoist and it can't be beat if it's equipped with a Heil Hydro. Look for the two pistons of solid steel under the body—then you can be sure it's a Heil dump.

Heil Dump Bodies

Heil Hoists mount with Heil bodies on all makes of motor trucks. The body mounted on the truck shown above is a special Excavating type built especially for heavy duty work. Catalog 140 illustrates all Heil Bodies in detail. Send for it today.

THE HEIL CO.

1243 - 26th Avenue **Milwaukee, Wis.**

Heil Dump Body mounted with Heil No. 5 Hydro Hoist mounted on a 5-ton Sterling.

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A Strictly One Man Machine

CAPACITY 1¼ to 2½ CU. YDS. PER MINUTE.

Equipped with absolutely positive and efficient excavating, feeding and cleanup device. Clears path 8 feet wide. Guaranteed to excavate harder material and to clean up better than any loader of its kind on the market, bar none.

Positive self-cleaning track, 1500 square inches of bearing surface, less than 10 lbs. per square inch.

Digging and crowding speeds 4 and 20 ft. per minute. Traveling speeds ½ to 2½ miles per hour.

Digging position quickly and easily adjusted and absolutely maintained by special grade control shoe.

Swivel chute permits loading in any position.

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Manufacturers of SPEARWELL CONSTRUCTION EQUIPMENT

Oakland California

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Body of one piece sheet steel with rounded self-cleaning corners. No chains to rattle. 1½ yard capacity. Built for Ford, Indiana, International, Graham and Service Trucks. Manufactured by

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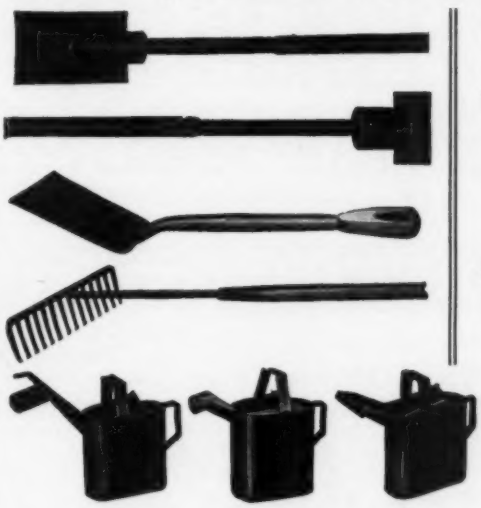

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The Berg machine saves time and money in surfacing and smoothing all types of concrete structures including bridges, buildings, walls, culverts, dams, foundations, monuments, etc. Adaptable to either interior or exterior work. Used on many of the country's largest contracts.

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Equip your Ford Truck with a Stewart Quick Acting Self-Dump Steel Body. Operates from the driver's seat—no power, no hoist, nothing to get out of order. Order yours today—it's fully guaranteed. Or write for complete information.

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the lists of valuable catalogs on pages 73 and 74? A careful study of these pages will be of help to you in locating the machinery, materials or apparatus you want.

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THE WAUGH sign on a rock drill, drill sharpener, hoist, or compressor outfit is the contractor's and engineer's "high sign" everywhere. They know this "high sign" always implies high speed, high efficiency and completely satisfactory performance. Look for it.

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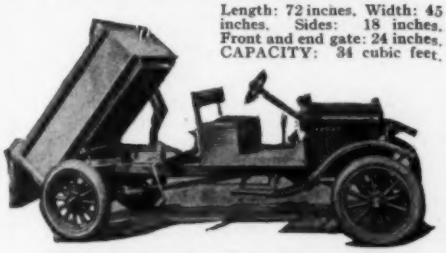
Marion Dump Body

Length: 72 inches. Width: 45 inches. Sides: 18 inches. Front and end gate: 24 inches. CAPACITY: 34 cubic feet.



Here it is—the real producer that never balks. It's durable and dependable.
Marion bodies can be used with hand hoist or as an automatic type.
This is a most satisfactory Dump Body for handling stone gravel, sand, dirt, coal and other loose material. Always ready for the hardest kind of service.
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How much is your water supply curtailed by sand or mud accumulation? Do your pumps wear out or require frequent cleaning from this cause?

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This process may be repeated at any time, so that the screen and adjacent strata can be kept clear.
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gives better protection for all exposed metal or wood work at lowest cost per year.

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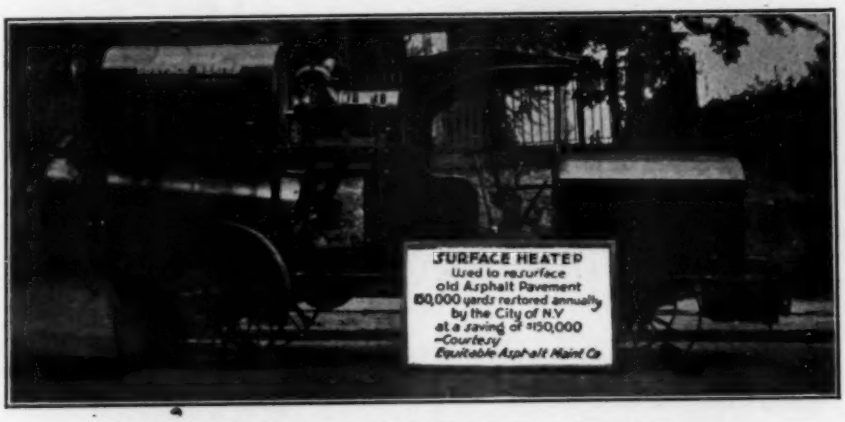

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The new improved model is operated with a gasoline engine, designed for power at low speed. The change in this machine from steam to gasoline practically doubles its capacity, simplifies its operation, saves time and labor, permitting a more economical operation of the machine. It eliminates all dirt, water and steam and makes it possible to resurface without flame, from 1,500 to 2,000 square yards of pavement in an eight-hour day. It is easy to start and operate and anyone that can operate an automobile can easily run this machine.

A letter or post card will bring you full
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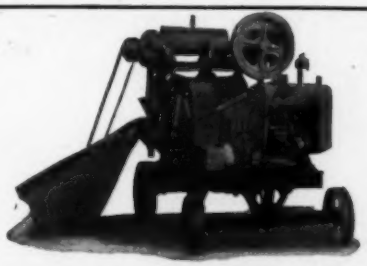

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120 to 150 Cu. Yds. in 10 hours with an Atlas one bag Mixer.

Atlas Mixers are of sturdy dependable construction, and the 7-S is regularly equipped with multiple cylinder LeRoi Engine, giving excess power.

We build 3½ ft., ½ bag, 1 bag and 2 bag Mixers.

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When you study your pay roll on that road making job, remember that the

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will save its cost on a mile of roadway, put the road material on more quickly and economically and do it better.

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right on the job, easily moved, do another good job you cannot afford to do by hand, while Burch Car Unloaders do the work of 17 men at the cost of three. Write for other contractors' experience.

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With Strike-off Measuring Hopper

load stock-piled concrete aggregates with accuracy and dispatch. The same machine has many other uses, excavating, grading, etc.

Catalog 523

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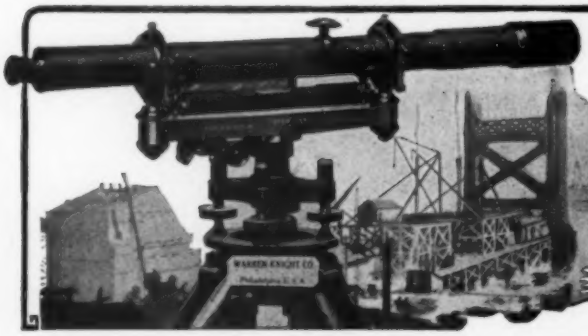

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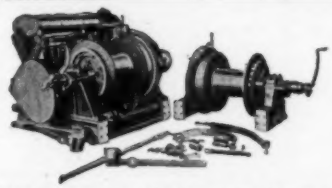

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Full loads dumped quickly and easily at very high dumping angle and good ground clearance at maximum dumping angle.

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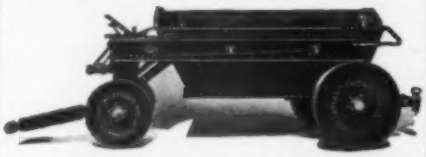

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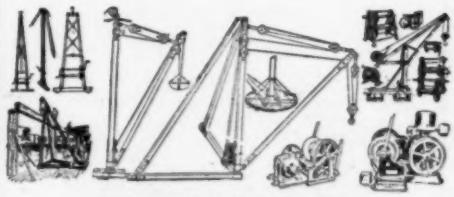

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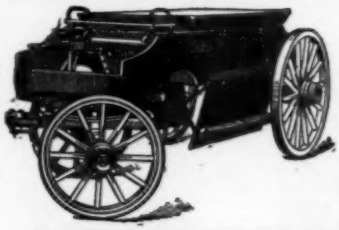

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Modern progress calls for modern methods and modern methods call for modern equipment. In road building the progressive contractor considers Monarch Industrial Tractors Indispensable.

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Research engineers of the United States Bureau of Public Roads have found that old elevating graders cut down production even beyond the time lost by breakage. They urge the installation of new machines.

The 1925 Western Elevating Grader

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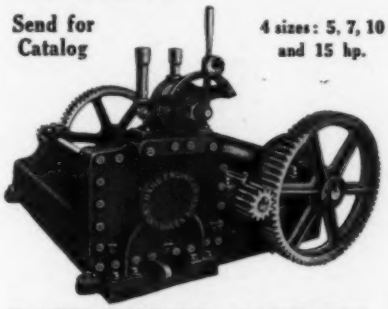

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Good cars are the result of experience and careful design.
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High capacity, economy, portability—these are the features that are making the Evinrude Centrifugal Pump increasingly popular in a score of industries. Men who have been bothered for years with drainage problems requiring a small pumping outfit have found that the Evinrude is without an equal for this work.

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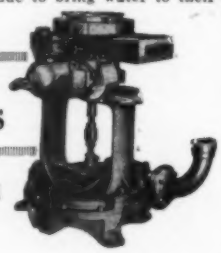
Send today for our literature describing and illustrating the many ways in which this pump is now saving money for its users.

A "Ford" in the pump field.

5000 GALLONS

per hour at 20 ft. head



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WE are constantly having letters from contractors in proof of the efficiency and economy of the Huber Motor Roller.

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The Huber Manufacturing Co.

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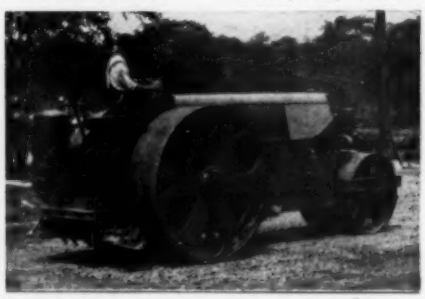

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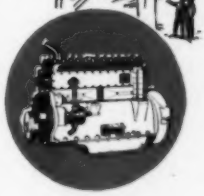
The Red Seal Power Era!



TODAY is the gasoline era and it emphasizes the outstanding leadership of Red Seal Continental Motors.

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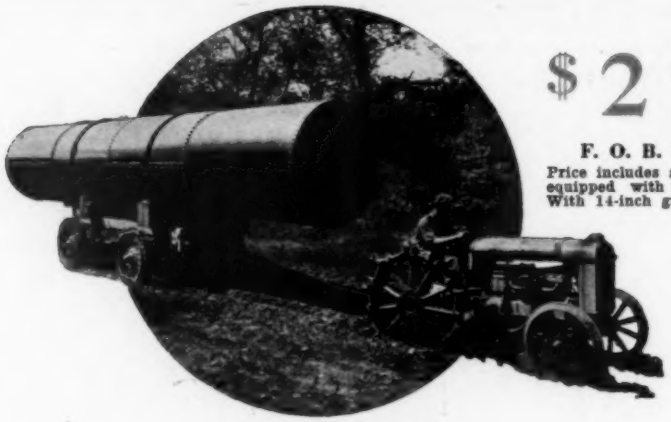

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Price includes set of 2 wheels equipped with 12-inch grips. With 14-inch grips—$250.

—so they tried a set of these wheels!

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This St. Louis contractor was speedily convinced of the fact that tractor performance is not measured by tractor cost. The boiler-plate pipe (9500 pounds) and trailer (5000 pounds) must be pulled over soft ground—in some places mud almost hub deep. Previously this would have been considered the work of a heavy tractor of the crawler type. The Fordson with standard wheels had failed. But with Grid-Iron-Grip Wheels equipped with 14-inch shoes the work was quickly accomplished. Figure for yourself the cost on this job. Any Fordson dealer will be glad to give you a demonstration.

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Grid-Iron-Grip Wheels
for Tractors

Grid-Iron-Grip Wheels embody the crawler principle. The loosely-mounted grips are exclusive and fully covered by patents.

Write for illustrated literature describing the many features, details of construction, year 'round uses, etc. Know how other contractors have saved money.

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By introducing motorized equipment into the contracting business, the efforts of human labor are being applied to much more intelligent service.

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greatly increases its usefulness Carried by the frame and individually controlled, this planer can be adjusted to any desired position. The driver, while seated, has positive control of adjustments within easy reach.

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Provides:
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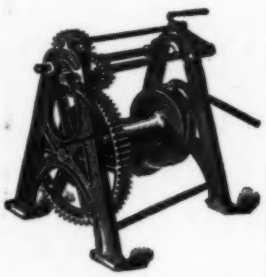

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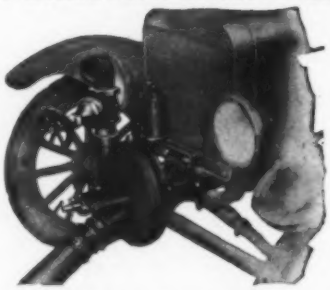

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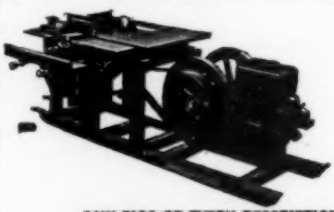

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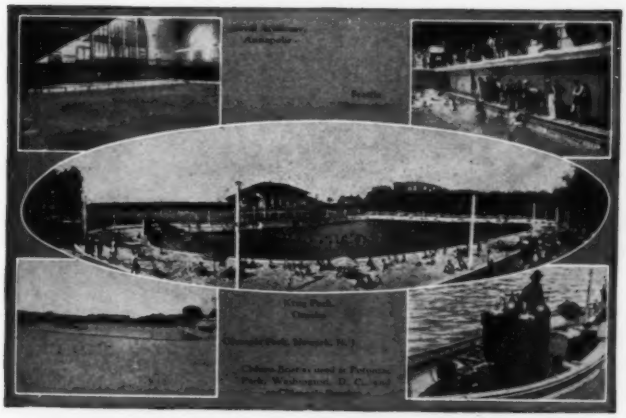

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INDEX TO ADVERTISERS IN THIS ISSUE

Acme Road Machinery Co..... 114
Acme Wagon Co..... 120
Aeroil Burner Co..... 112
Alamo Engine Co..... 95
Alexander, Edgar..... 125
American Cement Machine Co.. 113
American Saw Mill Machy. Co.. 122
American Steam Pump Co..... 122
Ames & Sons Corp., Oliver..... 99
Armstrong & Bros., Co., R. S.... 125
Atlas Engineering Co..... 111
Austin Machy. Co., W. E..... 125
Austin-Western Road Mach'y Co 107
Avery, O. B..... 131

Bacon Co., E. R..... 123
Bacon Engineering Sales Co..... 135
Badger Meter Mfg. Co..... 142
Baker Mfg. Co..... 113
Barber Asphalt Co..... 152
Barber-Greene Co..... 26
Barrett Co..... 12
Barrett, Thos. L..... 126
Bartholow Co., J. W..... 139
Bay City Dredge Works..... 109
Beckwith Machinery Co..... 137
Blaw-Knox Co..... 34
Boehck Machy. Co., Inc..... 140
Bond Co., The..... 128
Borchert Ingersoll Co..... 130
Boston & Lockport Block Co.... 120
Brandeis Machy. & Supply Co.. 127
Brewster & Williams, Inc..... 133
Bright Co., Graham B..... 139
Brooks Co., R. E..... 133
Brown-Bevis Co., Inc..... 123
Brown, Fraser & Co..... 124
Brown Thos. M..... 127
Brown & Sites Co..... 135
Buffalo-Springfield Roller Co.... 48
Buhl Machine Co..... 125
Bunting Hardware & Machy.Co. 130
Burch Plow Works..... 112
Burnite Machy Co..... 124
Byers Machine Co..... 24

Cannon & Ashmead..... 125
Carey Co., Philip..... 38
Central Foundry Co..... 145
Chadwick Bros. Co..... 140
Chausse Oil Burner Co..... 112
Clarksburg Supply & Equip. Co. 140
Climax Engineering Co..... 44
Clyde Co..... 127
Clyde Equipment Co..... 136
Clyde Iron Works Sales Co..... 42
Conard & Buzby..... 147
Conboy Co., John A..... 136
Concrete Mach'y & Supply Co.. 123
Concrete Surfacing Machy. Corp. 108
Connelly Machinery Co..... 132
Connery & Co..... 115
Construction Machinery Co..... 32
Continental Motors Corp..... 117
Contractors Supply & Equip. Co. 130
Contractors Equipment Co..... 128
Cox, H. L..... 136
Cunningham, Ortwayer-Salisbury Co..... 140
Curd Equipment Co., Geo. B.... 134
Curtis Pneumatic Machy. Co... 93

Dake Engine Co..... 115
Dallett Co., The..... 106
Davis Engineering Co., C. B.... 123
Day & Maddock Co..... 135
De Huff & Hopkins..... 136
Denver Rock Drill Mfg. Co..... 108
Dixon Crucible Co., J..... 110
Dixie Machinery Co..... 127
Dobbie Foundry & Machine Co.. 122
Dodge, C. R..... 128
Dolan-Tucker Smith Equipt. & Supply Co..... 126
Domestic Engine & Pump Co... 97
Dopp & Co., J. W..... 128
Dow Chemical Co..... 91
Dravo Equip. Co...126–133–136–137

Earnest Bros..... 139
Edelen & Boyer Co..... 137
Engineering Products Co..... 124
Equitable Asphalt Main. Co.... 111
Erickson Co., Inc H. E..... 129
Everett & Co., R. B..... 139
Everhot Manufacturing Co..... 102
Evinrude Motor Co..... 116

Fife Equipment Co., George W.. 126
Flory Mfg. Co..... 113
Foote Fdry .Co., J. B., The..... 101
Ford Meter Box Co..... 149
Ford Motor Co..... 119
Ford Power Equip. Exposition.. 120
Fraley, Lawrence V..... 131
French & Co., A. W..... 102
Fuchs Equipment Co..... 132
Funkhouser Equipment Co..... 131

Gartner Co., F. W..... 139
General Machinery Co..... 140
General Motors Truck Co..... 151
Gierke-Robinson Co..... 126
Giles & Ransome..... 137
Ginsberg-Penn Co..... 133
Godwin Co., W. S..... 122
Good Roads Machinery Co..... 18
Good Roads Supply Co..... 129
Green & Co., G. S..... 133
Gross Hardware & Supply Co., P. 141

Hadfield-Penfield Steel Co..... 6
Haiss Mfg. Co., Geo..... 112
Hale & Co., Wm. H..... 129
Harnischfeger Corp..... 16
Harris, R. L..... 138
Hatcher Co., S. T..... 131
Hedge & Mattchis Co..... 128
Heil Co., The..... 105
Heltzel Steel Form & Iron Co... 79
Hercules Corporation..... 104
Herr Dump Car Mfg. Co..... 36
Herr, Henry R..... 136
Hill, Nicholas S..... 147
Hinckley Motors, Inc..... 40
Hobbs, Inc., Lewter F..... 139
Hofius-Ferris Equipment Co.... 140
Hubbard-Floyd Co., Inc..... 133
Huber Manufacturing Co..... 116
Hughes, W. E..... 131
Hughes-Keenan Co., The..... 113
Hunter Machy. Co..... 141
Hyland Co., R. H..... 126

Insley Manufacturing Co..... 14
Interstate Machy. & Supply Co.. 132

Jaeger Machine Co..... 20

Keiser-Ginsberg Engr. Co..... 123
Kelly Co., E. B..... 134
Kellog-Burlingame Co..... 129
Kenney, G. C..... 131
Kentucky Rock Asphalt Co..... 89
Keystone Driller Co..... 50
Kiesler Co., Jos. F..... 106
Kinney Mfg. Co..... 85
Kochring Co..... 4–81
Koppel Ind. Car & Equip. Co... 115
Kuhlman & Co., W. A..... 136

Lakewood Engineering Co..... 49
Lane Equipmrnt Co., T. J..... 136
La Plant-Choate Mfg. Co..... 114
Lidgerwood Mfg. Co..... 99
Littleford Bros..... 107
London Concrete Machy. Co, Ltd. 124
Louer Co., W. B..... 126
Ludlow Valve Mfg. Co..... 141
Lufkin Rule Co..... 102

Mack Trucks, Inc..... 95
McGraw, Inc., James..... 140
Martin Machinery Co., E. A..... 130
McDonald & Burgmen..... 125
McKiernan-Terry Drill Co..... 22
Marion Steel Body Co..... 109
Mead-Morrison Mfg. Co..... 48
Meyer Co., Henry H..... 128
Milburn Co., Alex..... 122
Miller Equipment Co..... 133
Mills Contractors Equip Co..... 138
Minneapolis Equipment Co..... 129
Monarch Tractors, Inc..... 114
Moore A. B., Jr..... 125
Moore Equip. Co., H. W..... 124
Mussens Limited..... 124

National Cast Iron Pipe Co..... 120
Nat'l Water Main Cleaning Co.. 141
Nelson, W. A..... 139
Neptune Meter Co..... 144
Newport Culvert Co..... 28
Nixon-Hasselle Co..... 138
Noble Co., K. B..... 124
Norden Co., Wm. H..... 134
Northwest Equip. Co., Inc..... 132

O'Brien Co., Inc., Martin J..... 137
Olsen, Ole K..... 127
Osgood Company..... 93

Pacific Flush-Tank Co..... 114
Pattison Supply Co., W. M..... 135
Peden Equipment Co..... 135
Pegg, E. F..... 135
Pennsylvania Cement Co..... 115
Perine & Co..... 147
Perkins Co., P. I..... 128
Pickering Governor Co., The.... 104
Pioneer Bucket Co..... 122
Pitometer Co..... 108
Pittsburg Machy & Equip Co... 137
Pittsburgh Meter Co..... 105
Pope Equipment Co..... 135

Queen City Supply Co..... 134

Rabbeitt, C. F..... 131
Raber & Lang Mfg. Co..... 116
Raymer Equip. Co..... 130
Roshalt Co., T. W..... 130
Rossiter Co., Edgar A..... 147
Ruane Machinery Co..... 158
Ruckstell Sales & Mfg. Co..... 120
Russell Grader Mfg. Co..... 104

Sasgen Derrick Co..... 114
Sauerman Bros..... 106
Siebert-Milburn Co..... 135
Shannon & Co., Jacob J..... 137
Smith-Booth-Usher Co..... 123
Smith & Co., Geo. F..... 131
Smith Co., T. L..... 30
Snare Corporation, Frederick.... 147
Solvay Process Co..... 110
Southern States Equipment Co.. 127
Spears-Wells Machy. Co., Inc... 106
Standard Machy. & Equip. Co.. 138
Standard Oil Co. of Ind..... 87
Staley & Morris, Inc..... 137
Steinbarger Co., H. N..... 124
Sterling Wheelbarrow Co..... 35
Stewart Iron Works Co..... 108
Sullivan Machinery Co..... 110
Superior Boiler Works..... 106
Superior Supply Co..... 126

Taylor Collapsible Horse Co., The 108
Texas Co., The..... 121
Thew Shovel Co..... 8
Toon & Wilson..... 109
Tractor & Machy. Sales Co..134–140
Tractor Grip Wheel Co..... 118
Trevor Co., H. B..... 132
Truscon Steel Co..... 2
Tulley Equipment Co..... 132
Turner & Moore Mfg. Co..... 97
Turner Co., C..... 138
Tyler Co., N. B..... 128

Union Water Meter Co..... 120
United Motor Products Co..... 83
Universal Road Machinery Co.. 104
U. S. Cast Iron Pipe & Fdry. Co. 146

Vulcan Iron Works..... 49

Wallace Equipment Co..... 129
Wallace & Tiernan Co., Inc..... 143
Warren Bros. Co..... 106
Warren-Knight Co..... 112
Waterhouse, Clifford..... 130
Western Contractors Supply Co. 126
Western Material Co..... 138
Western Supply Co..... 132
Western Wheel Scraper Co..... 114
West Michigan Equipment Co... 129
Wettlaufer Bros..... 129
Whayne Supply Co., R. C..... 127
Wheeler Murray Co..... 132
Whinery, S. B..... 134
Wickwire Spencer Steel Co., Inc. 10
Wilkins, J. D..... 134
Williams Co., W. W..... 135
Williamsport Wire Rope Co..... 46
Wilson-Weesner Co..... 139
Wilson, W. R..... 134
Wood Hydraulic Hoist & Body Co 101

Yancey Bros..... 125

Ziegler & Co., Inc., Wm. H..... 130
Ziegler Machy. Co., Geo. W..... 138

For Directory of Consulting & Contracting Engineers, Landscape Architects, Etc., see pages **147, 148, 149**

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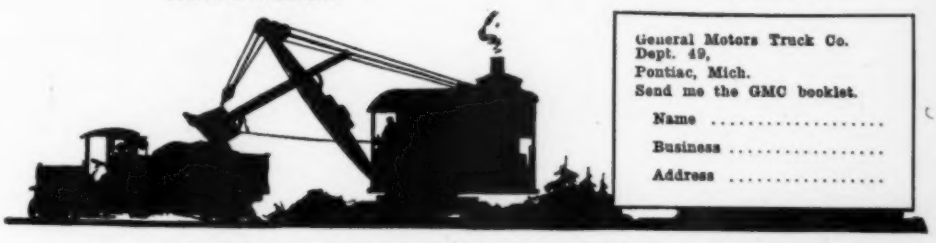

"Standard Equipment"
of Successful Contractors

Iroquois Tandem Rollers, by reason of their high power, quick reverse, long life and low maintenance cost, are used exclusively by many of the leading contractors and by large municipalities in all parts of the world.

Like all products of the famous Iroquois Line, these rollers are service-tested equipment—and represent over 40 years' experience in the design and operation of street and road-building machinery.

The Iroquois Tandem Roller is made in four sizes—2½-ton, 5-ton, 8-ton and 10-ton to meet all requirements for asphalt, brick, wood blocks, macadam, new grades or golf links. Write for complete specifications.

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THE BARBER ASPHALT COMPANY

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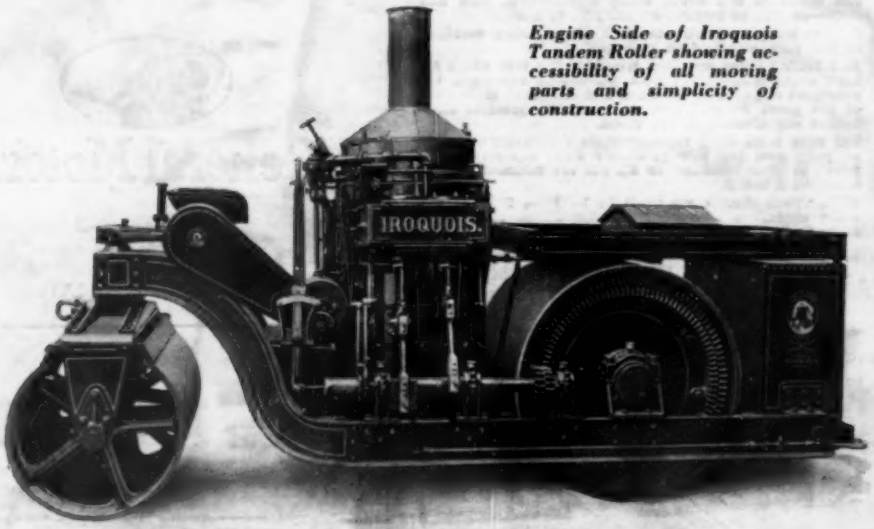

Engine Side of Iroquois Tandem Roller showing accessibility of all moving parts and simplicity of construction.